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For related information see also *Astronautics*.

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Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 936
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS N.A.
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 938
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 938
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) N.A.

89 ASTRONOMY 942
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 943
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 944
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 946
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 946
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 947

Note: N.A. means that no abstracts were assigned to this category for this issue.

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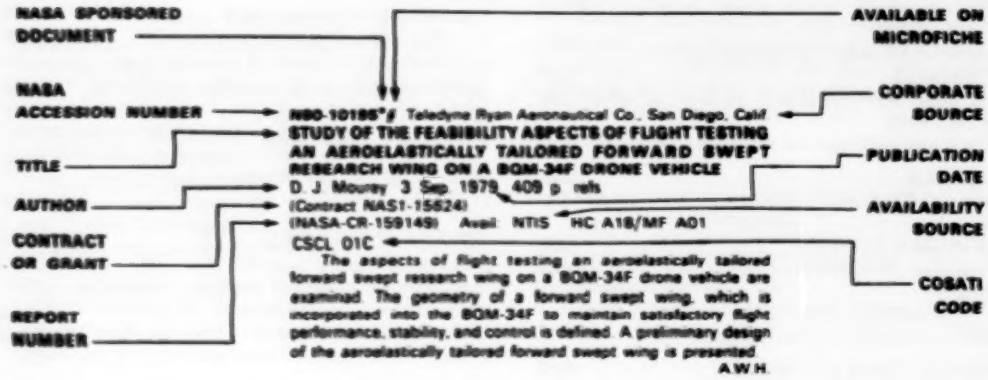
TYPICAL CITATION AND ABSTRACT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TITLE
STUDY OF THE FEASIBILITY ASPECTS OF FLIGHT TESTING AN AEROELASTICALLY TAILORED FORWARD SWEPT RESEARCH WING ON A BQM-34F DRONE VEHICLE
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D. J. Mourey 3 Sep. 1979 409 p refs
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The aspects of flight testing an aeroelastically tailored forward swept research wing on a BQM-34F drone vehicle are examined. The geometry of a forward swept wing, which is incorporated into the BQM-34F to maintain satisfactory flight performance, stability, and control is defined. A preliminary design of the aeroelastically tailored forward swept wing is presented.
A.W.H.

ON-GOING RESEARCH PROJECTS

This is a listing of research projects - not publications

AERONAUTICS

Includes Aeronautics (general); Aerodynamics; Air Transportation and Safety; Aircraft Communications and Navigation; Aircraft Design, Testing, and Performance; Aircraft Instrumentation; Aircraft Propulsion and Power; Aircraft Stability and Control; and Research and Support Facilities (air). For Related Information See Also Astronautics.

1.0001, SOFTWARE DEVELOPMENT AND APPLICATION FOR DYNAMIC ANALYSIS OF THE TILT ROTOR RESEARCH AIRCRAFT

J.E. Grimes, California State University & Colleges, California Polytechnic State University, School of Science & Mathematics, Dept. of Computer Science & Statistics, *San Luis Obispo, California* 93407 (NAS 2-10364)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0002, RESEARCH STUDY ON C3 FOR NAVAL AIRCRAFT

R.C. Hansen, R.C. Hansen Inc., *Tarzana, California* 91356 (DN890180; N00019-79-M-0401)

Research study of the needs, deficiencies, and technical frontiers in communications, command, and control technology.

This study will survey sources to establish needs, deficiencies, and technical frontiers for communications, command and control in naval aircraft for such functions as weapon control, electronic warfare, reconnaissance and surveillance, communications, etc. The eventual intent is to provide a rationale for research activities that is solidly based on expected operational needs and scenarios.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0003, EIGENVECTOR AND EIGENVALUE ANALYSIS OF FINITE DIFFERENCE SCHEMES USED TO SOLVE THE EULER EQUATIONS

R.S. Shevell, Stanford University, School of Engineering, Dept. of Aeronautics & Astronautics, *Stanford, California* 94305 (NCA 2-745001)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

1.0004, SUPPORT EQUIPMENT FOR MADAIR

W. Goree, Superconduction Technology Corp., *Mountain View, California* (DN981089; N62269-78-C-0143)

Support equipment will be utilized for preliminary integration, the MADAIR sensor and the towed bird. This contract supports work unit *ZU 701, Agency Accession No. DN 681083.*

A convertible horizontal liquid helium Dewar with shock mounts, card cage support structure and gradiometer support structure will be designed and fabricated.

SUPPORTED BY U.S. Dept. of Defense, Naval Air *Development Center, Sensors & Avionics* Tech Directorate

1.0005, MATERIALS RESISTANT TO EFFECTS OF V/STOL AIRCRAFT ON PAVEMENTS AND SUPPORT AREAS

R.B. Brownie, U.S. Dept. of Defense, Navy, Civil Engineering Lab., Naval Construction Battalion Center, *Port Hueneme, California* 93043 (DN987059)

To determine the potential magnitude and seriousness of exhaust blast effects of future planned V/STOL aircraft on pavements and support areas and to identify materials technology to alleviate these effects.

The technical approach is to (1) identify V/STOL aircraft planned or under development, (2) determine landing and takeoff characteristics of jet exhaust (velocity, temperature, direction, duration, etc.) from V/STOL aircraft, (3) determine the impact of high temperature erosion characteristics on maintenance and repair of existing pavements and support facilities, and (4) identify technical approaches for new materials for use in pavements and other facilities to support V/STOL aircraft operations.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Facilities Engineering Command

1.0006, AIRCREW GLIDING ESCAPE SYSTEM

J. Matsuo, U.S. Dept. of Defense, Navy, Naval Weapons Center, *China Lake, California* 93555 (DN695409)

To provide ejecting aircrew men with a reliable aerodynamic decelerator that will, in addition to its present capability of operating reliably (both in a low speed, low altitude, or a high speed ejection from a jet aircraft), incorporate provisions for gliding flight. A high degree of maneuverability, configuration, packaging and deployment of this system is to be such that it will be compatible with ejection seat-equipped Navy aircraft of 1978 and beyond.

Conduct an initial survey to identify desirable features of current gliding parachute configurations and identify critical performance parameters. (Innovative design studies will devise means to overcome opening time, opening shock and high speed reliability problems.) Generate a performance specification and devise testing and evaluation techniques unique to maneuverable gliding parachutes. An in-house design effort, exploiting advanced technology, materials, and packing methods will result in a prototype system which will be evaluated against contractor designs. Results of evaluation will provide a basis for a design specification. Fleet evaluation and preparation of a procurement package will complete the program.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

1.0007, FAA NOW-CASTS

D. Haugen, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab., *Boulder, Colorado* 80302 (RAA7662B)

PROJECT OBJECTIVE: To evaluate the effectiveness of meteorological satellite data products in improving local weather services to the aviation community.

CURRENT YEAR PLAN: To establish a computer-driven communication and satellite imagery display between Colorado State University, Fort Collins, CO., and the National Weather Service Forecast Office, Denver, CO.

SUPPORTED BY U.S. Dept. of Transportation, Federal Aviation Admin.

1.0008, PROGRAMS OF RESEARCH IN FLIGHT SCIENCES

H. Liebowitz, George Washington University, School of Engineering & Applied Sciences, Dept. of Civil Mechanical & Environmental Engineering, 725 23rd St. N.W., Washington, District of Columbia 20037 (NCC 1)

SUPPORTED BY U.S. National Aeronautics & Space Admin., *Langley Research Center*

1.0009, INVESTIGATION OF OPTIMUM WING CONFIGURATIONS WITH EDGE SEPARATION

C.E. Lan, University of Kansas, Lawrence Campus, School of Engineering, Dept. of Aerospace Engineering, *Learned Hall, Lawrence, Kansas 66044* (NCC 1)

SUPPORTED BY U.S. National Aeronautics & Space Admin., *Langley Research Center*

***1.0010, ENERGETIC MATERIALS FOR CARTRIDGES* AND CARTRIDGE ACTUATED DEVICES (CADS)**

D.H. Brooks, U.S. Dept. of Defense, Navy, Naval Ordnance *Station, Indian Head, Maryland 20640 (DN996201)*

To develop and demonstrate feasibility of (1) a new percussion primer system which will incorporate a thermally stable *formulation and designs which are resistant to environmental* and structural effects, and (2) a series of propellants which will meet the specified performance requirements for cartridge actu*ated device (CAD) applications.*

This program will consist of the following two major efforts: (1) new primer design, and (2) new propellant series. (1) *New primer design - this portion of the overall program will* consist of the following two efforts: (1) primer design, and (2) formulation development. (a) Primer design - in FY 79, various design concepts will be developed and evaluated with emphasis upon eliminating composition dusting and dimensional variability as well as providing a hermetic sealing capability. In FY 80, *a primer design will be selected for feasibility testing.* The primer design will be configured to replace the M42 series primer which is the most common configuration employed in aircrew automated escape system (AAES) applications. (b) Primer formulation -candidate formulations will be processed in FY 80 and analyzed from the standpoint of critical operational and performance parameters (i.e., high temperature stability, resistance to moisture and dusting, and input energy requirements). In FY 81, the optimum formulation will be selected and in conjunction with the new primer design, testing will be conducted in FY 82 to evaluate stability, sensitivity, hermetic sealing capability, reliability, vibration/shock, cartridge compatibility, and ballistic evaluation. (2) New propellant series - computer modeling, developed under past category 6.2 effort, of typical CAD systems will be employed to define optimized thermophysical constants required for a new CAD propellant series. Upon precisely defining desired characteristics, a research level effort will be initiated in FY 80 to develop a propellant to conform with these requirements. Of special concern will be products of reaction, flame temperature burning rate at various ambient tem*peratures in the pressure range of interest and future cost poten*tial.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air *Systems Command*

1.0011, DEVELOPMENT OF THE OCV, PART III

M. Rudd, Bolt Beranek & Newman Inc., *50 Moulton St., Cambridge, Massachusetts* 02138 (DF140940; F33615-77-C-3012)

Current airspeed indicating systems for military aircraft are accurate to a minimum speed indication of 50 knots (approximately). Present sensing system errors in the low speed range are significant and are of sufficient magnitude to cause safety-of-flight problems when hovering or approaching land for V/STOL vehicles. The objective of this study is to further develop the optical convolution velocimeter, examine operational suitability and equipment environmental requirements, and test the device. The device is to be capable of accurate sensing and displaying airspeed in the range of V/STOL type aircraft.

The Air Force Flight Dynamics Laboratory has been developing various time-of-flight sensing techniques for velocity measurement. Of particular promise on the effort is the optical convolution velocimeter. This device has been patented. Dr. M. *Rudd of BB&N* has developed an appropriate theory for single sensor detector and has designed, fabricated, and tested a prototype unit. The approach is to proceed with further development with a) examining environmental requirements for such a device, b) improving operational characteristics and c) testing and evaluation. Three prototype units will be designed, fabricated, and tested. This approach has been suggested in an unsolicited proposal by Bolt, Beranek and Newman, Inc., of Cambridge, MA.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0012, COCKPIT DISPLAY OF TRAFFIC INFORMA*TION (CDTI) CREW FUNCTION ASSESSMENT*

J.R. Tole, Massachusetts Inst. of Technology, Graduate School, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (NCC 1)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0013, PREDICTION OF AERODYNAMIC HEATING *TO GENERALIZED THREE-DIMENSIONAL SHAPES*

H.W. Kipp, McDonnell Douglas Corp., *P.O. Box 516, St. Louis,* Missouri 63166 (DF139390; F33615-77-C-3003)

*At high speeds, above Mach 3.5, aerodynamic heating be*comes a design constraint for missiles and aircraft. Therefore, definition of the heating to the flight vehicle is required to ade*quately design the structure and define the operating limits.* Poor definition of the heating can result in weight increases, degraded performance and increased cost. The objective of this *effort is the development of an analysis tool for the prediction* of heating to flight vehicles. This will improve the ability to determine heating levels thereby decreasing uncertainties in *design.*

Several programs have been developed for the prediction of heat transfer rates to flight vehicles. All of these programs *have limitations which significantly restrict their use.* These programs will all be reviewed and the most promising one will be selected for modification. After existing limitations have been removed, the program will be extended to more general flows such as the complex flow in the fin region.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0014, DEVELOPMENT OF ADVANCED FLIGHT CONTROL ACTUATION SYSTEM CONCEPTS FOR *NAVAL AIRCRAFT*

R. Fucht, Bendix Corp., Flight Systems Laboratory, *200 Holister Rd., Teterboro, New Jersey* 07608 (DN981063; N62269-78-C-*0247)*

The general objective of this task is to examine the broad spectrum of new flight control actuation concepts with respect to potential advantages and interrelationships with other aircraft systems. The resultant effect of these new concepts will be evaluated against projected aircraft mission and maintenance requirements. Recent advancements in on-board computers, electrical power equipment and solid-state processing components may offer advantages to new aircraft, especially with growing emphasis on combat survivability and simplified squadron maintenance. The specific objective of this effort is to determine how a contractor-developed actuation concept can be adapted for aircraft primary flight controls. The unique feature of this concept is the use of two different power mediums, electricity and bleed air, to drive a single actuator. This contract supports work unit ZA601, Agency Accession No. DN681080.

An actuator will be designed to T 2C aircraft rudder specifications. It will be fabricated, lab tested and flight demonstrated on a T 2C test bed. Ultimate application is aimed at V/STOL aircraft.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0015, NAVY VEHICLE DESIGN AND CONSTRUCTION - MICROPROCESSOR DIGITAL FLIGHT CONTROL INVESTIGATION

R.F. Stengel, Princeton University, School of Engineering & Applied Sciences, Dept. of Aerospace & Mechanical Science, *Box 430, Princeton, New Jersey 08540 (DN975352; N00014-78-C-0257)*

Future Navy aircraft will utilize digital logic to perform the complex flight control functions demanded by their severe mission objectives. Cost factors may dictate microprocessor implementation of these digital control laws. While hardware cost may ultimately reach low levels, the development costs associated with microprocessor technology will not be trivial. This investigation is directed towards developing new methodologies required for the design, analysis, and flight evaluation of advanced low cost digital flight control systems.

During this second year's effort, two input/two output longitudinal and lateral-directional command augmentation systems will be designed using optimal control theory and implemented using microprocessor technology. Various strategies of redundancy management for multiple processors will be examined. System failures of several types will be simulated in a lab and in flight, and the performance of the redundant system will be determined. A variable stability navigation aircraft will be flown for 20 hours to conduct these tasks.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

1.0016, AIRCRAFT MANEUVER LOADS PREDICTION DEFICIENCY STUDY

Unknown, Grumman Aerospace Corp., *S. Oyster Bay Rd., Bethpage, New York 11714 (DN890158; N00019-79-C-0061)*

Identify deficiencies in the practices/methodologies used to predict aircraft maneuver loads.

Systematically review recent practices and existing wind tunnel and flight loads data to identify and categorize problems followed by preliminary evaluation of procedures to overcome deficiencies.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

1.0017, ADVANCED FUEL DELIVERY SYSTEM

R.E. Anderson, General Electric Co., *Aircraft Engine Group, 1 Jimson Rd., Cincinnati, Ohio 45215 (DN796803; N00140-75-C-0040)*

Design, develop, and demonstrate a lightweight, compact, containment resistant, fuel delivery system for use on advanced augmented gas turbine engines.

The overall program has four phases: Phase I - (12 months) -preliminary system design, dynamic model, starting element development, centrifugal filtration investigation completed, as reported under Accession Number DN596806, by publication of GE report R73AEG420 of November 1973; Phase II - (13 months) - engine fuel delivery system component design, fabrication and bench testing. Completed by publication of GE report R76AEG318 of May 1976; Phase III - (7 months) -bench testing of a complete fuel delivery and control system and a preliminary design layout of flight weight fuel delivery components. Scheduled for completion April 1978; and Phase IV - (14 months) -procure and test a new vane start element for the unitized pump under contract N00140-78-C-0059 (DN889779).

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Propulsion Test Center

1.0018, DETERMINE THE IFR OPERATION PROFILE OF THE GENERAL AVIATION SINGLE PILOT

G.S. Weislogel, Ohio State University, Columbus Campus, School of Engineering, Dept. of Aviation, *190 N. Oval Dr., Columbus, Ohio 43210 (NAS 1-15969)*

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

1.0019, BASIC RESEARCH IN STRUCTURES AND DYNAMICS

J.J. Olsen, U.S. Dept. of Defense, Air Force, Flight Dynamics Lab., Wright Patterson A.F.B., Dayton, Ohio 45433 (DF141950)

This work unit supports the technical base functions of the Structural Mechanics Division of the Air Force Flight Dynamics Laboratory. It addresses the problem areas of transonic unsteady aerodynamics, flutter, aeroelastic optimization and integration of aeroelastic disciplines. The goal is to create a numerical, analytical and experimental array of techniques to integrate the aeroelastic design, analysis and testing of aircraft structures to reduce the cost of design, acquisition and operation of new aircraft. This work unit will obtain substantial improvements in our ability to design, analyze and optimize aircraft structures for unsteady aerodynamic forces, vibrations, flutter, loads and aeroelastic control system interactions.

Initial developments will include the development of a three-dimensional transonic unsteady aerodynamic computer program for flutter applications. Finite element structural programs will also be modified to automate the input of data and the presentation of results.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0020, IMPROVED COMPUTATIONAL METHODS FOR NONLINEAR AEROELASTIC OPTIMIZATION

F.K. Bogner, University of Dayton, Research Inst., *300 College Park Ave., Dayton, Ohio 45469 (DF141890; AFOSR-78-3487)*

This work unit supports the technical base functions of the Structural Mechanics Division of the Air Force Flight Dynamics Laboratory. It addresses the problem areas of transonic unsteady aerodynamics, flutter, aeroelastic optimization and integration of aeroelastic disciplines. The goal is to create an array of techniques to integrate the aeroelastic design and analysis of aircraft structures to reduce the cost of design, acquisition and operation of new aircraft. This work unit will obtain substantial improvements in our ability to optimize aircraft structures for unsteady aerodynamic forces, vibrations, flutter, loads and aeroelastic control system interactions.

Initial developments will include the application of transonic unsteady aerodynamic computer programs to strength/flutter optimization problems. Finite element structural programs will also be modified to automate the input of data and the presentation of results.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0021, ADVANCED PAYLOAD SYSTEMS SPECIFICATION AND USER GUIDE FOR NEW COD/VOD AIRCRAFT

J. Shefrin, Boeing Co., Vertol Division, *P.O. Box 16858, Philadelphia, Pennsylvania 19142 (DN981013; N62269-78-C-0318)*

This effort is intended to provide comprehensive guidance for structuring the payload systems section of detail specifications for applicable new Navy aircraft. An advanced system will be defined making use of emerging technologies for payload systems handling/restraint to provide optimized crashworthiness and personnel survivability. The output of this effort, a specification with user guide, will optimize future Navy payload systems design requirements during the conceptual phases of aircraft development.

Current and planned operational roles of COD/VOD type aircraft will be analyzed along with cargo types and cargo/passenger mixes. Peace time/wartime environmnts will be considered in defining aircraft reconfiguration requirements for various payload types. Handling/restraint concept trade-offs will include leg type restraints, barrier nets, net to pallet systems, modularized packaging, and other advanced concepts. Crashworthiness concepts will be emphasized, using advanced energy management hardware to substantially reduce loads reacted through the restraint system to the aircraft interfaces, while reducing handling/restraint time. The cargo/passenger interface will be analyzed, with concept trade-offs including energy absorbing barrier nets, cargo forward of passengers, and palletized

seating to enhance crash survivability and reduce payload handling and reconfiguration time.

SUPPORTED BY U.S. Dept. of Defense, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate

1.0022, HELICOPTER LANDING GEAR DESIGN AND TESTING CRITERIA INVESTIGATION
J.D. Crist, Bell Helicopter Textron of Textron Inc., *Hwy. 183, P.O. Box 482, Fort Worth, Texas* 76101 (DA0E3860; DAAK51 79 C 0011)

To develop new landing gear design criteria/military specifications for all classes of Army helicopters. Main thrust of program is to derive a single specification that will incorporate design, testing, crashworthiness, handling, etc., for both wheel- and skid-type Army helicopter landing gear.

A survey of helicopter landing gear design, test, accident, etc., related documen tion will be performed. These findings will be used to modify existing landing gear specifications and assess Mil-L-XXXX specification (proposed). The resulting criteria will be evaluated for conformity of application to all classes of Army helicopters. Either Mil-L-XXXX will be recommended for adoption as a totally new specification or the existing design specifications will be modified as required.

SUPPORTED BY U.S. Dept. of Defense, Aviation Research & Development Command, Applied Technology Lab.

1.0023, NAVY VEHICLE DESIGN AND CONSTRUCTION - AIRCRAFT NONLINEAR DYNAMIC/AERODYNAMIC INTERACTIONS
A.H. Nayfeh, Virginia Polytechnic Inst. & State University, School of Engineering, Dept. of Engineering Science & Mechanics, *Blacksburg, Virginia* 24061 (DN975184; N00014-79-C-0103)

Modern combat aircraft are required to perform and maneuver in the nonlinear aerodynamic regime usually with separated flow over a significant portion of the wing and body. The dynamics of aircraft at high angles-of-attack is also nonlinear, hence there is a nonlinear coupling of the dynamics and aerodynamics of modern fighter aircraft. The objective of this research investigation is therefore to develop a technique for predicting the motion of an aircraft caused by a prescribed time-dependent configuration of the control surfaces while at high angles-of-attack.

The principal investigator will couple the fully nonlinear dynamical equations of motion to a general unsteady nonlinear vortex-lattice model of the flow-field which includes leading edge vortex separation. The unsteady vortex-lattice model will predict the nonlinear aerodynamic forces and moments of the aircraft including a history of the time-dependent flow-field. These forces and moments are computed simultaneously with the equations of motion of the aircraft to determine its motion in maneuvering flight.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

1.0024, STOL AIRCRAFT VIBRATION CONTROL
C.S. Doherty, Boeing Co., *7555 E. Marginal Way S., Seattle, Washington* 98124 (DF139920; F33615-77-C-3035)

STOL aircraft vibration is expected to be substantially higher than for conventional aircraft, especially at low frequencies, due to the size, spacing, and exhaust impingement required of STOL engines. This environment could affect personnel and the reliability of all major sub-systems, and the low frequencies may render conventional vibration isolators ineffective. The objective of this work is to predict STOL aircraft vibration and to assess its impact on equipment and isolator design. The result could be new design and test requirements for STOL aircraft equipment, revised handbooks and specifications, and a final payoff in increased system reliability.

The vibration induced by blown flaps of AMST prototypes will be studied and the resulting aircraft vibration will be predicted. The predictions will be confirmed and refined by comparison with measured AMST vibration to the extent that such data are available. The resulting interior vibration environment will be compared to present vibration design requirements, and methods for minimizing this vibration will be investigated.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Flight Dynamics Lab.

1.0025, ANALYSIS OF DOD CONDUCTED RESEARCH AND TECHNOLOGY PROGRAMS/BENCHMARK MEASUREMENTS IN THREE-D SUBSONIC DIFFUSERS
J. Whitelaw, University of London, Imperial College of Science & Technology, *Prince Consort Rd., South Kensington, England, United Kingdom* (NASW 3258)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Aeronautics & Space Technology

ASTRONAUTICS

Includes Astronautics (general); Astrodynamics; Ground Support Systems and Facilities (space); Launch Vehicles and Space Vehicles; Space Transportation; Spacecraft Communications; Command and Tracking; Spacecraft Design, Testing, and Performance; Spacecraft Instrumentation; and Spacecraft Propulsion and Power. For Related Information See Also Aeronautics.

2.0001, ANALYSIS OF SATELLITE NAVIGATION SYSTEMS
B.E. Schutz, University of Texas, Austin Campus, School of Engineering, Dept. of Aerospace Engineering & Engineering Mechanics, *200 W. 21st, Austin, Texas* 78712

Satellite navigation is now in extensive use for surveying and point positioning applications. These systems use the U.S. Navy Transit Satellite; however, the next generation system Global Positioning Satellite will enter initial check-out and validation in 1977. To evaluate the hardware and software requirements for various applications as well as to introduce state-of-the-art astronautical systems into the classroom, a JMR-1 Doppler Positioning system has been acquired. Integration of this hardware with a computer system will provide real-time satellite tracking capability for laboratory applications and systems analysis.

SUPPORTED BY University of Texas

CHEMISTRY AND MATERIALS

Includes Chemistry and Materials (general); Composite Materials; Inorganic and Physical Chemistry; Metallic Materials; Nonmetallic Materials; and Propellants and Fuels.

3.0001, STEP-GROWTH PROPAGATION OF HIGH MOLECULAR WEIGHT RIGID ROD POLYMERS
J.E. Wolff, S R I International, *300 Ravenswood Ave., Menlo Park, California* 94025 (DF053530; F49620-78-C-0110)

AF function - advanced AF aircraft will require lightweight, high strength, readily processible polymeric materials to meet high performance flight requirements. Deficiency - current fiber reinforced composite structures experience problems of fiber-matrix debonding and strength reduction due to environmental effects. Objective - the objective of this research is to define the parameters and factors which govern the efficient propagation of rigid rod polymers in solution. How work contributes - this work will contribute to the processing science base which is essential to the design and fabrication of molecular or self-reinforced structural composites.

A systematic study of the effect of monomer concentration, stoichiometric balance, heating and stirring rates, and reaction time on the polymerization, molecular weight distribution and solution characteristics of p-phenylene-2, 6-benzo-bisthiazole polymer will be conducted. The parameters of the solvents required for the polymerization medium of the aforementioned model polymer and the kinetics of rigid rod reactions will be determined.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Office of Scientific Research

3.0002, INFLUENCE OF FLUID RHEOLOGY AND AIR RESISTANCE ON THE BEHAVIOR OF LIQUID JETS AND DROPS
S.L. Goren, University of California, Berkeley Campus, School of Chemistry, Dept. of Chemical Engineering, *Berkeley, California* 94720 (NCA 2-50001)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

3.0003, OPTIMAL ADDITIVES TO PRODUCE ANTI-MISTING FUELS
M.C. Williams, University of California, Berkeley Campus, School of Chemistry, Dept. of Chemical Engineering, *Berkeley, California* 94720 (NCA 2-50905)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

3.0004, IMPROVEMENT IN MECHANICAL PROPERTIES OF LOW CONDUCTIVITY CARBON FIBERS BY IMPREGNATING WITH POLYMERS AND METALS
H.L. Needles, University of California, Davis Campus, School of Agriculture & Environmental Sciences, Dept. of Textiles & Clothing, *Davis, California* 95616 (NCC 2)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

3.0005, A STUDY OF DRY-CHEMICAL FIRE-EXTINGUISHING MECHANISMS
E.L. Knuth, University of California, Los Angeles Campus, School of Engineering & Applied Science, Dept. of Energy & Kinetics, *405 Hilgard Ave., Los Angeles, California* 90024 (NCA 2-390903)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

3.0006, MATERIALS SUPPORT TECHNOLOGY - SIC FIBER REINFORCED GLASS MATRIX COMPOSITES
J.J. Brennan, United Technologies Corp., United Technologies Research Center, *400 Main St., East Hartford, Connecticut* 06108 (DN875788; N00014-78-C-0503)

The use of fiber reinforced composite materials in naval aircraft is increasing because of their low density, strength, and stiffness. Present materials are limited to use at relatively low temperatures, however; composites with higher temperature capabilities are needed. The objective of this task is to study composite systems that appear to offer potential for use at higher temperatures.

A comprehensive fabrication parameter study of composites composed of SIC monofilament and SIC yarn incorporated into high temperature glass or glass-ceramic matrices will be conducted. Fabrication parameters such as hot pressing temperatures, pressure, time and atmosphere will be studied and their effect on composite density and microstructure will be investigated. Micrographic and fractographic analysis will be carried out.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0007, PRECIOUS METAL OXIDES AS SUPERCONDUCTOR CANDIDATES
B.L. Chamberland, University of Connecticut, Storrs Campus, Graduate School, Dept. of Chemistry, *Storrs, Connecticut* 06268 (INT7717719)

The aim of this award is to contribute to the general knowledge of superconducting oxides and to develop means for predicting superconducting behavior in oxide materials (i.e., reduced electrical resistance in compounds consisting of oxygen and an element or radical). The research -- which has potential applications in areas such as power transmission, high-speed computers, and generators -- will explore the crystal chemistry and physical properties of a family of precious metal oxides (AxPt3O4 and AxPd3O4) as possible superconductors and catalysts.

The project will involve scientists from the University of Connecticut, who will prepare, purify and grow the oxide crystals, and French scientists from laboratories in Grenoble who will conduct the crystallographic and neutron diffraction experiments as well as the superconductivity tests.

SUPPORTED BY U.S. National Science Foundation, Div. of International Programs

3.0008, THE MATRIX-ISOLATION INFRARED-LASAR-RAMAN STUDY OF THE MOLECULAR STRUCTURE OF CHLORINE NITRATE
J.H. Hall, Morehouse College, Graduate School, *223 Chestnut St. S.W., Atlanta, Georgia* 30314 (NSG 7652)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

3.0009, PROPERTIES AND CHARACTERISTICS OF SHAPE MEMORY ("MARMEM") MATERIALS
C.M. Wayman, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Mining Engineering & Metallurgy, *207 Engineering Hall, Urbana, Illinois* 61801 (DMR77-00363)

This is a continuation of research on the basic mechanism(s) of the shape memory effect in non-ferrous metallic materials for selected compositions, associated microstructural characteristics, and mechanical properties. Shape memory processes have been studied primarily on single-crystal copper-zinc and copper-zinc-aluminum alloys at specified compositions under this program. A phenomenological model has been advanced to describe observations on shape memory behavior for these alloys. In order to check the generality of the model, with the goal of elucidating the basic mechanism(s) of shape memory behavior, critical experiments will be carried out on selected compositions for the following systems: titanium-nickel, copper-zinc, copper-zinc-aluminum, and silver-cadmium. In addition, advanced studies will continue on the nature of the martensite-to-martensite transformation for a few shape-memory materials. This is a renewal of NSF Grant DMR74-23684 A01.

SUPPORTED BY U.S. National Science Foundation, Div. of Materials Research

3.0010, MATERIALS SUPPORT TECHNOLOGY - SILICON CARBIDE METAL-MATRIX COMPOSITES
J.A. Cornie, Avco Corp., Specialty Materials Division, *Lowell Industrial Park, Lowell, Massachusetts* 01851 (DN975393; N00014-79-C-349)

The Navy has a need for improved high performance materials in aircraft structures, jet engines and missiles. This program will examine the use of silicon carbide filaments to reinforce metal alloys thereby providing high specific strength and stiffness in the resulting metal-matrix composite. Metal-matrix composites have potential for reducing weight of structural components and increasing allowable temperatures.

The role of the surface carbon layer in imparting high strength to silicon carbide filaments will be explored. Alternative types of coatings such as silicon, titanium nitride, and titanium carbide will be attempted in order to improve the bonding strength of silicon carbide to metal matrices such as aluminum and titanium. Effects of surface layer thickness and variations in compositional profiles on filament strength will be found. Promising surface treatments for filaments will be employed to produce silicon carbide-aluminum composites and the mechanical properties of these composites will be determined. Microstructural-flaw relationships will be explored for the filaments with their various surface coatings.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0011, STRUCTURE AND MECHANICAL PROPERTIES OF HIGH TEMPERATURE GLASSY AND MICROCRYSTALLINE ALLOYS 16219-MS
N.J. Grant, Massachusetts Inst. of Technology, School of Engineering, Dept. of Metallurgy & Materials Science, *77 Massachu-*

setts Ave., Cambridge, Massachusetts 02139 (DA0G9069; DAAG29-79-C-0077)

Production, characterization, and evaluation of metallic glasses with high glass transition temperatures, and thermally stable microcrystalline alloys. Study of the factors which influence the toughness and ductility of initially amorphous or microcrystalline alloys. Relevance - the research has the potential for forming the basis of new high-toughness forged components of aircraft, gun, and armor systems, and thermally stable erosion-resistant linings for gun tubes.

Introduction of mechanically 'soft' energy absorbing crystallization products in initially glassy alloys, and the rapid upquenching of initially glassy structures to produce a very fine grain size.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

3.0012, CRYSTALLIZATION AND THERMAL HISTORIES OF LUNAR AND TERRESTRIAL COMPOSITIONS

D.R. Uhlmann, Massachusetts Inst. of Technology, School of Engineering, Dept. of Metallurgy & Materials Science, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (EAR79-08761)

This study is a continuing investigation which was previously funded by NASA but transferred to NSF. The investigation is concerned with the flow and crystallization behavior of lunar compositions; the formation of lunar glasses; the thermal regimes in impact melts; the phenomena of solute partitioning and diffusional homogenization in phases in rocks; the growth and dissolution of gas bubbles in silicate melts; and quite generally with thermal histories of partly-glassy breccias and highly crystalline rocks.

The study will include an experimental determination, over wide ranges of temperature, of nucleation, crystal growth and viscous flow of plagioclase compositions as well as the matrix compositions by partly glassy lunar breccias. Improved theoretical descriptions of concentration profiles in olivines and solute partitioning under continuous cooling conditions will be carried out and will be used to determine the thermal histories of lunar and terrestrial rocks. Viscous sintering under conditions of continuous cooling will be studied, as will the processes by which gas bubbles are eliminated from complex silicate melts.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

3.0013, NONHOMOGENEOUS FLOW OF MACROMOLECULAR SOLUTIONS AND MELTS

M.V. Tirrell, University of Minnesota, Minneapolis Campus, School of Engineering, Dept. of Chemical Engineering & Materials Science, *105 Morrill Hall, Minneapolis, Minnesota* 55455 (DMR78-26629)

This research deals with the behavior of macromolecular solutions and melts. It is based on the thesis that there are differences in the behavior of such liquids when they are flowing in systems where the velocity gradient is uniform everywhere, and when the velocity gradient varies spatially. One of the effects that appears in the latter situation is that of macromolecular migration; i.e., macromolecules will migrate from regions of high-velocity gradient to regions of low-velocity gradient. Specifically, the flows to be examined are: Poiseuille flow in a capillary, flow between rotating flat disks, flow in a packed chromatography column, and flow into an injection molding cavity. It is proposed to examine quantitatively the nature and extent of macromolecular migration and to test various theories that can explain this behavior. The ultimate aim is to gain a detailed understanding at the molecular level of this largely unexplored phenomenon.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0014, PROBLEMS IN MOLECULAR COLLISION THEORY

P. Pechukas, Columbia University, School of Arts & Sciences, Dept. of Chemistry, *Broadway & W. 116th St., New York, New York* 10027 (CHE7820066)

This grant supports research under the Quantum Chemistry Program in the general area of molecular collision theory. Particular attention will be given to new formulations of scattering processes. Beginning with results based on classical mechanics or semiclassical theory, Professor Pechukas will attempt to develop a tractable, systematic method for including quantum effects, which are often important in the interpretation of molecular beam data. In this way, the conceptually simpler theories of chemical reactivity may be improved in quantitative accuracy while remaining computationally feasible.

Professor Pechukas will also continue theoretical investigations of three other classes of important problems. These deal with: (1) classical mechanics of chemical reactions and transition state concepts, (2) semiclassical representations of non-adiabatic processes, and (3) connections between potential energy surface topography and molecular symmetry. An aim of the research is to relate statistical theory to molecular collision dynamics.

This is a renewal of research currently supported by NSF grant CHE7515458 at Columbia University.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0015, DEVELOPMENT OF FATIGUE RESISTANT TITANIUM ALLOYS

J. Kennedy, Grumman Aerospace Corp., *S. Oyster Bay Rd., Bethpage, New York* 11714 (DN890142; N00019-78-C-0305)

To evaluate fatigue improvement/heat treatment for Ti-6Al-4V.

The effect of solution treating and water quenching on the axial fatigue life of Ti-6Al-4V will be examined. Variables such as alloy composition, product form, solution treating temperature and stress amplitude will be considered.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

3.0016, LIQUID-STATE PHOTOELECTRON SPECTROSCOPY

P. Delahay, New York University, Washington Square & University College of Arts & Sciences, Dept. of Chemistry, *421 1st Ave., New York, New York* 10012 (CHE77-07025 A02)

Current work in liquid-state photoelectron spectroscopy will be continued to include: (1) extension to high photon energies from 10 eV up to 40.8 eV to enhance emission of unscattered (in the liquid) electrons and obtain spectra with band structure similar to gas-phase photoelectron spectra; (2) extension to higher vapor pressures from approximately 100 microns up to 5 torrs to achieve conditions for general application to almost any liquid and to water in particular. The angular distribution of low-energy photoelectrons will also be studied to obtain information required for the derivation of threshold functions and the calculation of the barrier energy at liquid-vacuum interfaces (conversion from external to internal photoionization energy). Interpretation of results will be carried out in three main ways: (1) analysis of energy distribution curves and second derivative curves by summation of contributions of scattered and unscattered electrons; (2) interpretation of surface and bulk photoionization energies in terms of asymmetric electronic polarization near the liquid-vacuum interface; (3) calculation of the gas-liquid red shifts (approximately 1 eV) in photoionization energy for neutral substances and the gas-liquid blue shift (approximately 2 to 3 eV) for anions. This is a renewal of support for research currently supported by Foundation grant CHE-7517019.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

3.0017, THE MECHANISM OF FRETTING FATIGUE CRACK INITIATION IN MEDIUM STRENGTH STEELS 15979-MS

D.J. Duquette, Rensselaer Polytechnic Inst., School of Engineering, Dept. of Metallurgical Engineering, *110 8th St., Troy, New York* 12181 (DA0G8994; DAAG29-79-C-0013)

To perform systematic studies of the basic mechanisms of crack initiation in fretting-corrosion-fatigue. Relevance - fretting and its extensions in fretting-corrosion-fatigue have been of serious consequence in engine and rotating structural components of Army aircraft. Such phenomena may also be responsible for some classes of problems in high-rate-of-fire weapons, and in ground vehicular components.

Experiments will be performed on a 4130 steel which develops a wide range of structures and properties upon heat treatment. Variables to be studied include differential hardness of flying surfaces, amplitude of slip, frequency, environment, temperature, and surface hardness.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

3.0018, MAGNETIZATION CHANGES IN SMALL VOLUME ELEMENTS BY STRESS CONTROL

K. Schroder, Syracuse University, L.C. Smith College of Engineering, Dept. of Metallurgy, *Link Hall, Syracuse, New York* 13210 (NSG 1654)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

3.0019, VAPOR PHASE DIAMOND GROWTH TECHNOLOGY

J.C. Angus, Case Western Reserve University, School of Engineering, Dept. of Chemical Engineering, *University Cir., Cleveland, Ohio* 44106 (NAS 3-21965)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

3.0020, DEVELOPMENT OF A DATA SYSTEM FOR MULTI-CHANNEL SPECTROMETERS

R. Megargle, Cleveland State University, School of Arts & Sciences, Dept. of Chemistry, *1983 E. 24th, Cleveland, Ohio* 44115 (NSG 3308)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

3.0021, HOT CORROSION OF METALS AND ALLOYS BY FUSED SALTS

R.A. Rapp, Ohio State University, Columbus Campus, School of Engineering, Dept. of Metallurgical Engineering, *190 N. Oval Dr., Columbus, Ohio* 43210 (DMR79-11910)

This is a fundamental investigation to determine the mechanisms of the accelerated oxidation of metals and alloys beneath thin films of fused salts. The solubilities of several oxides in the fused salts Na2SO4 and Na2CO3 at 1200K and 1173K, respectively, have been established as functions of the oxygen and sodium oxide activities. Electrochemical corrosion and polarization studies of metals coated by thin salt films will be studied. The results will be compared with theoretical predictions of models for the acid or basic dissolution and reprecipitation of the protective oxide in the salt film. The pure metals Fe, Ni, Co and Cr and the alloys Fe-Cr, Ni-Cr, Co-Cr, NiAl, Fe-Cr-Al, and Co-Cr-Al will be studied via electrochemical thin film methods for salt films of alkali sulfate, carbonate, chloride and vanadate in various oxidizing gases. Metal corrosion rates and activity gradients and shifts in the fused salt will be derived from the electrochemical studies for comparison with theoretical predictions.

This is a continuation of research previously supported by NSF Grant DMR75-172-4A01. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

3.0022, RESEARCH ON REFRACTORY D.S. EUTECTIC COMPOSITES T ENGINES

M.K. Thomas, U.S. Dept. of Defense, Navy, Naval Air Development Center, Aircraft & Crew Systems Tech Directorate, *Warminster, Pennsylvania* 18974 (DN833093)

To identify, produce and characterize new high-melting-point directionally solidified eutectic alloys which show promise for utilization in 1150 - 1370 C engine environments. This work was previously funded under Aircrft Materials Block Program, Accession No. DN 681081, work unit ZM601.

The microstructure of arc melted refractory metal base (CB and Cr) and Fe, Ni, Co base (based on a Battelle study) multi-component alloy buttons are examined and the most promising are directionally solidified and tested for strength and oxidation resistance.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

3.0023, NAVY VEHICLE DESIGN AND CONSTRUCTION - ORIENTED POLYMERS

J.L. White, University of Tennessee, Knoxville Campus, School of Engineering, Dept. of Chemical & Metallurgical Engineering, *W. Cumberland Ave. S.W., Knoxville, Tennessee* 37916 (DN775285; N00014-77-C-0236)

New polymeric compositions of high strength are of interest to the Navy for improved lightweight composites because lightweight organic structural materials can provide much improved payload/weight ratios in aircraft and surface effect ships. The proposed research will provide new materials and theoretical models to meet Navy needs in this area.

This work will be directed toward the preparation of biaxially oriented aromatic polyamide films from liquid crystalline polymer solutions. Experiments will be carried out to determine whether the successful one-dimensional approach utilized for fiber spinning can be extended to other shapes and structures.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

3.0024, IMPACT TESTING ON ORBITER HIGH-TEMPERATURE REUSEABLE SURFACE INSULATION TILES

D.J. Norton, Texas A & M University, College Station Campus, School of Engineering, Dept. of Aerospace Engineering, *P.O. Box F E 44, College Station, Texas* 77843 (NAS 9-15962)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

3.0025, ANALYSIS OF SULFUR RETENTION BY ASH SORBENTS DURING FLUIDIZED BED LIGNITE COMBUSTION

T.F. Edgar, University of Texas, Austin Campus, School of Engineering, Dept. of Chemical Engineering, *200 W. 21st, Austin, Texas* 78712

DESCRIPTION: Laboratory experimentations and mathematical modeling are being used to examine the behavior of Texas lignite during fluidized bed combustion. Of specific interest is the determination of the effects of alkaline ash materials and how they promote the retention of sulfur in the ash (e.g., as CaSO4) and ash re-injection. A fluidized bed test rig to process 2kg/hr. of lignite has been constructed and test runs are being performed. Data trends from the lab plant will be analyzed and a computer simulation program will be developed to aid in modeling the trends. The important process variables appear to be temperature, fluidizing velocity, and particle size, as well as the coal ash properties.

SUPPORTED BY University of Texas

3.0026, THE TERRESTIAL GROWTH OF LEAD-TIN-TELLURIDE BY TECHNIQUES RELATED TO LOW-GRAVITY GROWTH
W.A. Jesser, University of Virginia, School of Engineering & Applied Science, Dept. of Materials Science, *Garrett Hall, Charlottesville, Virginia* 22903 (NSG 1652)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

ENGINEERING

Includes Engineering (general); Communications; Electronics and Electrical Engineering; Fluid Mechanics and Heat Transfer; Instrumentation and Photography; Lasers and Masers; Mechanical Engineering; Quality Assurance and Reliability; and Structural Mechanics. For Related Information See Also Physics.

4.0001, LIGHT PROPAGATION THROUGH CLOUDS (COMMUNICATIONS)
D.P. Woodman, GTE Sylvania Inc., Electronic Systems Group & Western Division, *Mountain View, California* (DN975090; N00014-78-C-0716)

(A) Experimentally demonstrate that it is possible to communicate through clouds with substantial optical thicknesses. (B) Obtain data which can be used to evaluate models for the propagation of light pulses through clouds.

Laser pulses will be transmitted from a high flying aircraft, through a cloud, to a ground-based receiver. Observed pulse attenuation and distortion will be compared against the predictions of propagation models.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0002, SURVEILLANCE - VIBRATIONAL RAMAN UV DOWN CONVERSION
E.A. Stappaerts, Northrop Corp., Research & Technology Center, *1 Research Park, Palos Verdes Peninsula, California* 90274 (DN875655; N00014-78-C-0832)

The objective of this work unit is to contribute to the development of a satellite-mounted blue-green laser that is suitable for Navy communication and surveillance applicatons.

To accomplish the proposed objective, experiments and analyses will be conducted to demonstrate efficient frequency down conversion of UV excimer laser output to the blue-green spectral region. The experimental approach will involve the use of multiple order vibrational Raman scattering in a novel Raman oscillator/amplifier configuration that employs a noncorrosive molecular gas. To maximize the speed of data acquisition the third harmonic of a high repetition rate ND:YAG laser will be used as a Raman pump during the initial system optimization phase of the program. The YAG laser will then be replaced by an E-beam XECL excimer laser, and experiments will be carried out to demonstrate greater than 30% conversion efficiency into the blue-green.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0003, PREPARATION & PROPERTIES OF ALXGA/(1-X) AS CHROMIUM SINGLE CRYSTALS
G.L. Pearson, Stanford University, School of Engineering, Dept. of Electrical Engineering, *Stanford, California* 94305 (DN880268; N00014-78-C-0297)

This work seeks to develop methods of preparing semi-insulating layers of III-V semiconductors suitable for application in MIS FET structures. It further seeks to answer questions concerning the interactions and stability of chromium in gallium arsenide with aluminum substitution.

To prepare by liquid phase epitaxy single crystals of chromium doped gallium arsenide and gallium aluminum arsenide. To investigate the physical and electronic properties by various techniques including transient capacitance and photocapacitance and to apply these results towards preparing MIS FET structures.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0004, HUMAN FACTORS ENGINEERING
R.A. Erickson, U.S. Dept. of Defense, Navy, Naval Weapons Center, *China Lake, California* 93555 (DN482058)

To perform human factors engineering, research, and development on aircraft weapon systems and subsystems, including associated target acquisition display systems.

Mathematical modeling, human factors analysis, laboratory experiments, and flight tests will be conducted as appropriate to relate control, display, and sensor system characteristics to operator/aircrew performance. Analysis will be conducted to evaluate the observer submodel of several mathematical models of target acquisition by forward looking infrared systems (FLIR), and to develop an improved submodel based upon available experimental data. In-house and contracted laboratory research will be conducted on ship identification with a raster imaging system. Television adjusted to simulate FLIR imagery will be used to measure operator performance as a function of signal-to-noise ratio, horizontal and vertical resolution and target aspect. The usefulness of color coding symbology, scales, and alpha-numbers in strike aircraft cockpit displays will be evaluated in laboratory experiments.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Systems Command

4.0005, EXPERIMENTAL MEASUREMENTS OF UNSTEADY TURBULENT MIXING PHENOMENA ASSOCIATED WITH AERONAUTICAL SYSTEMS
C.M. Ho, University of Southern California, School of Engineering, Dept. of Aerospace Engineering, *3551 University Ave., Los Angeles, California* 90007 (DN775391; N00014-77-C-0314)

Turbulent mixing phenomena play a central role in many fluid dynamic applications ranging from the flow at the trailing edge of a wind to the flow in a chemical laser. The proposed research will examine, experimentally, the mixing between two co-flowing jets in which periodic oscillations will be introduced.

In recent years significant progress has been made in the interpretation of the nature of the turbulent mixing of two, steady, planar, co-flowing jets. The planned experimental work will extend this understanding to the unsteady case and, hopefully, will illuminate, for example, the nature of the unsteady flow at the trailing edge of an oscillating airfoil. The experiments will be conducted, initially, in water for visualization purposes, and subsequently, in air where detailed turbulence measurements will be made. The periodic disturbances will be introduced by oscillating vanes in the settling chambers upstream of the co-flowing jets.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0006, KINETICS OF HALOGEN GAS REACTIONS ON LIQUID AND SOLID SURFACES
P.G. Nordine, Yale University, School of Engineering, Dept. of Engineering & Applied Science, *206 Elm, New Haven, Connecticut* 06520 (ENG77-04122 A02)

Experimental studies will be done on the kinetics of halogen atom and molecule gasification of liquids, and their extension to halogen gasification of non-metallic condensed phase. The investigation will be carried out under experimental conditions which allow kinetic-parameter determinations and mechanistic interpretations. This program would make use of a new aerodynamic levitation flow reactor technique and CO2 laser or induction heating of levitated specimens in a unique approach to kinetic studies with corrosive gases and reactive condensed phase materials. It will include: (a) Extension of pilot F,F2/U(s,l) studies to obtain quantitative gasification rates, including measurements with supercooled liquid metal, if possible. (b) Survey of chlorination reactions for non-metallic condensed phases, with particular emphasis on chlorine gasification of metal oxides under reducing conditions. (c) Detailed kinetic studies of halogen/non-metallic solid or liquid systems selected on the basis of the exploratory results. (d) Interpretation of the gas/solid, liquid kinetic data in terms of the operative elementary steps and thermochemical properties of the reactants and products. Testing of useful new generalization and hypotheses. Critical evaluation of new observations on halogen gas/liquid,

solid systems reported in the current scientific and engineering literature.

SUPPORTED BY U.S. National Science Foundation, Directorate for Engineering & Applied Science

4.0007, ELECTRONIC TRANSITION LASERS
M. Krauss, U.S. Dept. of Commerce, National Bureau of Standards, Molecular Spectroscopy Div., *Washington, District of Columbia* 20234 (DN975325; N00014-79-F-0043)

The objective of this work is to study the effect of relativistic interactions on transition rates between electronic states of molecules. The effect of the mixing of various spin-free states will also be studied. The Navy has need for such information since these are important parameters in electronic transition lasers for naval communications and surveillance.

The contractor is determining the x doublet sigma, a doublet pi, b doublet sigma and c doublet sigma curves for the group II chlorides and computing the spin-orbit mixing of these states.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0008, EUV PLASMA SPECTROSCOPY
G.A. Doschek, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN980042)

Determine physical conditions such as electron temperature, density, turbulence, and mass motions in million degree laboratory plasmas. Develop new laboratory spectrographs based on recent developments in astronomical detector technology.

Modify and adapt existing solar physics spectrographs and hardware to laboratory facilities. Plasmas to be studied include laser-produced plasmas, low inductance vacuum spark plasmas, electron-ion beam plasmas and TOKAMAK plasmas.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Research Lab.

4.0009, HIGH ACCURACY RADIATION EFFICIENCY MEASUREMENT TECHNIQUES - STUDY IS RELATED TO SATELLITE POWER SYSTEMS
D.J. Kozakoff, Georgia Inst. of Technology, Engineering Experiment Station, *225 North Ave. N.W., Atlanta, Georgia* 30332 (NAS 8-33605)

SUPPORTED BY U.S. National Aeronautics & Space Admin., George C. Marshall Space Flight Center

4.0010, PLUME-INDUCED FLOW SEPARATION ON AXISYMMETRIC BODIES DURING POWERED SUPERSONIC FLIGHT
A.L. Addy, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Mechanical & Industrial Engineering, *207 Engineering Hall, Urbana, Illinois* 61801

A computer program has been developed to predict, for given separation models, the separation location on axisymmetric afterbodies during powered supersonic flight. At this stage, the base pressure and separation location are predicted based on the separation model and separation criterion. This program is being used: (1) to study the sensitivity of flow-separation location and base pressure subject to variations in the functional form of the separation criterion, and (2) to plan an experimental program to investigate plume-induced flow separation.

SUPPORTED BY University of Illinois

4.0011, NAVIGATION - SUPPORT FOR SATELLITE NAVIGATION SYSTEMS AN/WRN-4
J. Stelle, Magnavox Government & Industries Electronics Co., *1313 Production Rd., Fort Wayne, Indiana* 46808 (DN123404; N00014-77-C-0184)

Advance design satellite navigation equipments model AN/WRN-4 have been procured in limited quantity to provide high accuracy, all weather, global positioning capability required to support at sea r/d efforts. These systems are fully automatic, completely integrated, compact in size and lightweight to facilitate transfer between users while preserving high reliability and maintainability. Centralization of spare parts and repair facilities for those sophisticated and unique equipments assures continued quality control, accurate performance history and minimum investment in back-up spares.

The investigator will provide a bonded warehouse for maintaining a pool of spare parts and a supervisor to maintain liaison with equipment users in equipment trouble-shooting and spare parts replacement; will maintain inventory records, parts failure analyses and equipment performance data; will ensure timely repair of faulty parts, their inspection and their return to stock in accordance with proposed procedures, with funding limitation (96K) prescribed; will maintain three GFE model AN/WRN-4 (MX706MA) equipments for emergency back-up equipments spares; and will provide support for software modifications required as specifically directed.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0012, PRE-COOPERATIVE ENGINEERING EDUCATION PROGRAM
D.E. Holec, Purdue University, Graduate School, *Executive Bldg., West Lafayette, Indiana* 47907 (NGT 15-005-790)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

4.0013, NAVY VEHICLE DESIGN AND CONSTRUCTION - TOTAL SYNTHESIS ALGORITHMS FOR MULTIVARIABLE CONTROL SYSTEMS
M.K. Sain, University of Notre Dame, School of Engineering, Dept. of Electrical Engineering, *Notre Dame, Indiana* 46556 (DN975422; N00014-79-C-0475)

Digital technology permits the consideration of advanced new design concepts for aircraft and engine control systems not previously explored. Practitioners in control design have experienced limitations in the use of current control design techniques in meeting the challenges brought about by digital technology and the increasing sophistication of modern aircraft and engines. The objective of this research effort is to develop new methods for the direct synthesis of multivariable control systems. The synthesis methods will provide the capability to achieve desired (pre-specified) transient behavior and final response characteristics as well as pre-specified levels of insensitivity of those characteristics to inaccuracies in, or changes from, the assumed plant model.

Previous research by the principal investigator has laid the basic foundations for the total synthesis method, and the results for the decoupled multivariable control system are encouraging. This research effort will extend the theoretical basis to include the coupled multivariable control system as well as include desired robustness characteristics directly into the synthesis procedure.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0014, LARGE SCALE FIRE TEST AND EVALUATION OF CLOSED HEAD SPRINKLER SYSTEMS FOR AIRCRAFT HANGARS
L.M. Krasner, Factory Mutual Research Corp., *1151 Boston Providence Tpke., Norwood, Massachusetts* 02062 (DN987037; N68305-78-C-0054)

Evaluate performance of closed-head sprinkler systems using aqueous film forming foam by determining effects of head temperature ratings and sprinkler spacing on large scale fuel spill fires in high bay aircraft hangar areas. Results of the tests to be used in revision of design criteria for future Navy installations. This work supports work unit YF53.534.091.01.500, DN587075.

Contractor's test facility will be used to carry out tests with 900 sq. ft. pool fires with JP-4. Sprinkler head actuation times, spraying rates, fire containment and extinguishment times will be determined for the 60 ft. high test area with sprinkler head spacing 10 by 13-ft. for head temperature ratings of 165 degrees F (74 degrees C) and 268 degrees F (131 degrees C) or 360 de-

grees F (182 degrees C). Evaluate and compare test results with similar previous test results and document the results of the work.

SUPPORTED BY U.S. Dept. of Defense, Civil Engineering Lab., Naval Construction Battalion Center

4.0015, ENERGY CONVERSION - STUDIES OF TRANSONIC TURBINES WITH FILM-COOLED BLADES
J.F. Louis, Massachusetts Inst. of Technology, Div. of Sponsored Research, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DN975229; N00014-79-C-0132)

The objective of this project is to gather the necessary data essential in developing design procedures for high performance, cooled, highly loaded transonic turbine stages. The effort is theoretical and experimental in nature and is aimed at reducing the amount of cooling required per unit of work extracted. The research will contribute to increased performance of gas turbine engines needed particularly for naval aircraft propulsion, but useful as well to marine power plants and fixed installations.

Study will be made of heat transfer and shock-film interaction in the blade passages, in optimizing performance and design of blade passages, and secondary flow injection. A linear cascade is utilized to test performance of an optimum film cooled blade row, with study of blade shapes, angles of coolant injection, and angle of attack. Emphasis will center on the effect of unsteadiness on the pressure and heat transfer distribution around the blades.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0016, APPLICATION OF THE DELAMINATION THEORY OF WEAR
N.P. Suh, Massachusetts Inst. of Technology, School of Engineering, Dept. of Mechanical Engineering, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DN475061; N00014-76-C-0068)

The objective of the research is to examine wear problems associated with spline gears and improve their life cycle by application of the delamination theory of wear utilizing specific types of surface coatings.

The investigator is continuing experimental investigations of the delamination theory of wear that are aimed at the prevention of wear of aircraft splines by the application of soft metallic coatings. A detailed wear analysis of surface and surface coatings, before, during, and after the experiments will be conducted. Also bonding characteristics of the coating to substrate and their effect on the induction period will be investigated by using ionplated specimens. Upon project termination, this wear minimization technique will be ready for field testing.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0017, SOFT LANDING CONCEPTS
W. Nykvist, U.S. Dept. of Defense, Army, Natick Research & Development Command, *Natick, Massachusetts* 01760 (DA0H4395)

Determine the feasibility and practicability of employing 'soft landing' techniques to eliminate paper honeycomb energy dissipator material, simplify rigging, and to provide a 'drive-on/drive-off' capability.

Conduct studies and analyses of concepts utilizing primarily impulse-reaction (retrorocket) and pneumatic (airbag) techniques. Acquire an air-bag system from Bertin and Cie, France and evaluate it.

SUPPORTED BY U.S. Dept. of Defense, Army, Natick Research & Development Command

4.0018, CONCEPTS FOR A NEW PERSONNEL RESERVE PARACHUTE SYSTEM
H. Weber, U.S. Dept. of Defense, Army, Natick Research & Development Command, *Natick, Massachusetts* 01760 (DA0G4372)

This development will explore various concepts for a new steerable reserve parachute.

Investigate various types of steerable reserve canopies, parachute assemblies and harnesses.

SUPPORTED BY U.S. Dept. of Defense, Army, Natick Research & Development Command

4.0019, DETERMINATION OF FATIGUE CRACK CLOSURE STRESS AS A FUNCTION OF CRACK LENGTH, YIELD STRESS, STRESS RATIO AND ENVIRONMENT (ABBREV)
C.Q. Bowles, University of Missouri, Columbia Campus, School of Engineering, Dept. of Mechanical & Aerospace Engineering, *103 Engineering, Columbia, Missouri* 65201 (ENG79-08102)

The objective of this research program is to resolve the differences between conflicting results on crack closure recently reported in the literature. These are: 1) The effect of crack length on crack opening stress. 2) The effect of yield strength and prior strain history on crack opening stress. 3) The relation between mean stress (R-ratio) and crack closure. 4) The influence of environment on crack closure.

Additionally, it is believed that sufficient data will be obtained to provide functional relationships between the experimental variables and the crack opening stress for the first three items.

Three alloy systems are being studied, each of which has different fatigue properties and characteristics. These are 2024 aluminum alloy, 4130AQ (aircraft quality) steel and Ti-6Al-4V titanium alloy. The aluminum alloy and the steel are being tested in two heat treat conditions thereby providing two levels of yield strength. Finally, the aluminum alloy and the steel are being tested in two cyclic strain hardened conditions to determine the influence of prior strain history.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0020, SECOND-ORDER CLOSURE MODELING OF TURBULENT COMBUSTION
A.K. Varma, Aeronautical Research Associates of Princeton Inc., *50 Washington Rd., Princeton, New Jersey* 08540 (DN975373; N00014-79-C-0335)

The objective of this study is to develop a computation procedure for determining turbulent reacting flows in realistic geometries. This information is needed both for a better understanding of the complex flow-field within the combustors of aircraft turbojet engines and to provide a basis for advanced combustor design. Ultimately it should lead to improved propulsion systems for naval weaponry applications.

An evaluation will be made of a previously developed three species joint probability density function for modeling scalar correlations in an exact time-averaged formulation of turbulent reacting flows. These correlations will be used in a complete second-order closure analysis for simple parabolic axisymmetric and planar configurations. The results will be compared with available experimental measurements and will be studied to identify the most important interactions of the turbulence and combustion.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0021, FUNDAMENTAL STUDIES ON TURBULENT SWIRLING JET IGNITION
W.A. Sirignano, Princeton University, School of Engineering & Applied Sciences, Dept. of Aerospace & Mechanical Science, *Box 430, Princeton, New Jersey* 08540 (DN975314; N00014-79-C-0300)

The object of this research is to develop understanding, via analysis and experimentation, of the basic phenomena affecting the ignition, flame stabilization, and combustion and to develop predictive techniques useful for actual combustor design. This information is needed to enhance future design of jet engines for military aircraft, ramjets and rockets.

Numerical integration of governing partial differential equations and laser Doppler velocimetry measurements in cold and hot flows. Present analytic work is utilizing several models of

turbulence with different methods of solution and the results compared to experimental data. The governing time-averaged partial differential equations for turbulent, reactive, axisymmetric flows will be developed and the theory extended to obtain solutions for axisymmetric swirling flows. Concurrently, experimental concepts, utilizing a swirl generator with tangential injection of part of the fluid through slots into cylindrical ducts, is being developed to measure velocity correlations in cold swirling flows and flows with combustion.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0022, ANALYTICAL TRANSONIC FLOW
L. Sironich, Applied Science Research Associates Inc., *37 Riverside Dr., New York, New York* 10023 (DN623024; N00014-77-C-0359)

The determination of theoretical methods for the accurate prediction of the flows about high speed bodies is essential for the design of missiles and aircraft. This research is directed to the development of a very fundamental understanding of the steady and unsteady flow fields about bodies at transonic and supersonic flight.

A major effort is being directed to the analytical study of transonic and supersonic flows to complement the many ongoing numerical and experimental programs. Particular emphasis will be devoted to the study of the structure of the flow field within the framework of the Navier-Stokes equations and within the framework of higher order approximate equations, both viscous and inviscid. The direction of the research will be to exploit analysis as much as possible to develop a deeper understanding of the flow, as well as to leading to improved numerical procedures for attacking such flows.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

4.0023, ROCKET-BASED STUDIES OF THE ELECTRIC FIELDS AND PLASMA DENSITY ABOVE THE SIPLE VLF TRANSMITTER
M.C. Kelley, Cornell University, Ithaca Campus, School of Engineering, Dept. of Electrical Engineering, *242 Carpenter Hall, Ithaca, New York* 14853 (DPP78-23514)

Rocket-borne measurements of electric fields and plasma density will be measured during VLF-wave and particle events over Siple Station, Antarctica, during the austral summer of 1979-80 as part of the multi-group Balloon and Rocket Campaign to study wave-particle interactions in the magnetosphere. Four payloads will be launched from Siple on Nike-Tomahawk rockets provided by NASA. One payload will be used to look for parametric decay of VLF waves, a phenomenon that has application in controlled nuclear fusion research. A small side research effort will involve field testing of a recently developed automatic digital electric field ground station.

This is a renewal of grant number DPP76-21596.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Polar Programs

4.0024, THEORETICAL STUDY OF IONOSPHERIC IRREGULARITIES AND PLASMA INSTABILITIES IN THE MAGNETOSPHERE
R.N. Sudan, Cornell University, Ithaca Campus, School of Engineering, Dept. of Electrical Engineering, *242 Carpenter Hall, Ithaca, New York* 14853 (ATM78-26770)

This grant funds investigation in the areas of: ionospheric irregularites; triggered Whistler emissions; terrestrial kilometric radiation; and plasma convection.

Turbulence is a key interdisciplinary scientific issue. The ionosphere is one of nature's few examples of rather clean two-dimensional turbulence. This investigation, allowing comparison of ionospheric experience with computation simulation and analytic analysis promises significant progress in this area. The study of triggered Whistler emissions is likewise a study of importance to plasma physics in a much wider context than merely the terrestrial environment. The terrestrial kilometric radiation study, again, is a case of seeking to explain a specific observation in our terrestrial environment, with the underlying motivation of explaining the nature of a more basic wave-particle interaction process. The plasma convection studies, involving strong convection of a finite pressure plasma in a magnetic field driven by thermal and density gradients, should be a valuable theoretical contribution to the understanding of magnetospheric gross behavior.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

4.0025, PRELIMINARY STUDY ON THE POTENTIAL USEFULNESS OF ARRAY PROCESSOR TECHNIQUES FOR STRUCTURAL SYNTHESIS
L.J. Feeser, Rensselaer Polytechnic Inst., School of Engineering, Dept. of Civil Engineering, *110 8th St., Troy, New York* 12181 (NSG 1636)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0026, BIOMEDICAL APPLICATION OF ION THRUSTER TECHNOLOGY
D.F. Gibbons, Case Western Reserve University, School of Engineering, Dept. of Biomedical Engineering, *University Cir., Cleveland, Ohio* 44106 (NAS 3-22259)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0027, RESEARCH INITIATION - A STUDY OF DUAL RESONANCE IN HAMILTONIAN SYSTEMS
D.L. Richardson, University of Cincinnati, School of Engineering, Dept. of Engineering Science, *101 Baldwin Hall, Cincinnati, Ohio* 45221 (ENG78-05536)

The problem of resonance in Celestial Mechanics is to be considered for dynamical systems which possess simultaneously two commensurabilities among the frequencies of motion.

The system Hamiltonian H is assumed to have only two critical arguments so that canonical perturbation methods can be applied to reduce the system to a two-degree-of-freedom form. A solution for the motion within the regions of dual-deep resonance will constitute the major objective of the research. Some consideration is to be given toward the construction of a regularized solution which is valid both inside and outside the dual-deep resonance regimes.

The theory will be applied to specific problems in artificial satellite theory. The problem of the motion of a geosynchronous satellite with an orbital inclination close to the critical value of 63 degrees will be the subject of one such application.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

4.0028, EVALUATION OF THE PERFORMANCE OF WIND TURBINE CONCEPTS AND OPERATING WIND TURBINES
T.G. Keith, University of Toledo, School of Engineering, Dept. of Electrical Engineering, *2801 W. Bancroft St., Toledo, Ohio* 43606 (NCC 3)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

4.0029, LOW-COST AIR VEHICLE PARAMETER DATA ACQUISITION SYSTEM
J.M. Licht, U.S. Dept. of Defense, Navy, Naval Air Development Center, Engineering Support Group, Engineering Support Group, *Warminster, Pennsylvania* 18974 (DN981196)

To develop and procure a low-cost air vehicle parameter data acquisition system to be installed on NADC resident aircraft. This system is to have the capability to measure various parameters associated with aircraft performance such as throttle angle, turbine outlet temperature, and other parameters as necessary for useful project conformation. Features which must be

available within the system are standard digital format and a minimum of nine data tracks.

Study the current center needs for parameter identification and ascertain the most efficient system for meeting those needs. Design, fabricate and/or procure subsystem components such as (1) a digital recording subsystem, a data collection, digitizing and interface system, (2) temporary connections to existing and new sensor points in aircraft, (3) install, test and certify the installation in the aircraft, and (4) provide data transposing facilities in the laboratory for entry of the collected data in our CDC 6600 computer complex for analysis and data reduction operations.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Air Development Center

4.0030, PRE-COOPERATIVE ENGINEERING EDUCATION PROGRAM

M.J. Malkani, State University & Community College System of Tennessee, Tennessee State University, School of Engineering & Technology, Dept. of Electrical Engineering, *Nashville, Tennessee* 37203 (NGT 43-014-790)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of External Relations

4.0031, DESIGN OF A FOOD SERVICE HABITAT FOR A LARGE-SCALE SPACE STATION

L. Bell, University of Houston, Graduate School, *3801 Cullen Blvd., Houston, Texas* 77004 (NAS 9-15944)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

4.0032, DESIGN AND CONTROL OF REMOTE MANIPULATORS

C.C. Smith, University of Texas, Austin Campus, School of Engineering, Dept. of Mechanical Engineering, *200 W. 21st, Austin, Texas* 78712

DESCRIPTION: Remote manipulators have application in a wide variety of fields, including radiation "hot box" manipulation, space exploration, industrial automation, undersea exploration/fabrication, etc. Basic factors to be considered in manipulator design include strength, weight, speed and precision of response, etc. These factors are very much influenced by the type and location of actuators used in the design. This study concentrates upon the trade-offs between actuators located in joints and actuators located remote to a joint coupled to the joint via cables, etc. Comparisons will be made on the basis of dynamic response, precision, etc. and various classifications of tasks will be explored. This is the third year of a continuing endeavor.

SUPPORTED BY University of Texas

4.0033, NONLINEAR ESTIMATION THEORY

B.D. Tapley, University of Texas, Austin Campus, School of Engineering, Dept. of Aerospace Engineering & Engineering Mechanics, *200 W. 21st, Austin, Texas* 78712

By the application of the Martingale Theory and smoothing properties to the study of nonlinear stochastic dynamic systems, an approximate nonlinear estimation algorithm has been developed. In order to determine its effectiveness, the nonlinear estimation algorithm as well as the extended Kalman filter are applied to the problem of estimating the trajectory of a planetary spacecraft using range, range-rate, sun-planet and star-planet angle measurements. The result of the computer-simulated study shows that the nonlinear algorithm is superior to the extended Kalman filter when the measurements are highly non-linear. A comparison of the algorithm with other nonlinear estimation algorithms is being made also, in a continuing line of research expected to extend for several years.

SUPPORTED BY University of Texas

4.0034, TIRE NONLINEAR MODEL

C.M. Andersen, College of William & Mary, Williamsburg College, Graduate School, *Ewell Hall, Williamsburg, Virginia* 23185 (NAS 1-15965)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0035, MANAGEMENT, OPERATION, AND MAINTENANCE OF THE SPACE RADIATION EFFECTS LABORATORY

W. Heeman, College of William & Mary, Williamsburg College, Graduate School, *Ewell Hall, Williamsburg, Virginia* 23185 (NAS 1-9990)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

4.0036, COMPOSITE MATERIALS RESEARCH AND EDUCATION

C.T. Herakovich, Virginia Polytechnic Inst. & State University, School of Engineering, Dept. of Engineering Science & Mechanics, *Blacksburg, Virginia* 24061 (NCC 1)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

GEOSCIENCES

Includes Geosciences (general); Earth Resources; Energy Production and Conversion; Environment Pollution; Geophysics; Meteorology and Climatology; and Oceanography. For Related Information See Also Space Sciences.

5.0001, A STUDY OF THE MIDDAY AURORAS AT THE SOUTH POLE STATION

S.S. Akasofu, University of Alaska, Fairbanks Campus, Geophysical Inst., *Fairbanks, Alaska* 99701 (DPP78-20630)

An all-sky-camera will be operated at South Pole Station, Antarctica, during the period 1978 through 1980 to collect auroral data. This data will be used in conjunction with DMSP satellite photographs and interplanetary magnetic field data to investigate the interaction between the solar wind and the magnetosphere.

The all-sky-camera will be operated by the technician for another project, so no logistic support is required for this project.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Polar Programs

5.0002, GALILEO (JOP AND NIMS)

H. Masursky, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *2255 N. Gemini Dr., Flagstaff, Arizona* 86001 (9580-02236)

A near-infrared mapping spectrometer is being designed, to be flown on the upcoming Galileo mission. This instrument will map the mineral distribution of the surfaces of the satellites at spatial resolutions of 5 to 30 km. The individual phases and mixtures that are present will be defined, and the mineralogic provinces will be related to geologic provinces that are delineated by a multispectral, high resolution CCD imaging camera. Image and composition data will be correlated with magnetics and gravity.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0003, RADAR BACKSCATTER MODELING

G.G. Schaber, U.S. Dept. of the Interior, Geological Survey, Geologic Div., Branch of Astrogeologic Studies, *2255 N. Gemini Dr., Flagstaff, Arizona* 86001 (9580-02040)

STATE TO WHICH PROJECT PERTAINS: California.

During FY 79 we will complete the Death Valley radar backscatter studies manuscript and submit it for publication. The radar backscatter research efforts will be moved into the region

of north-central Arizona where Pliocene to Pleistocene age volcanic rock overlies vegetation-free sedimentary rocks. This region should represent an excellent Venus analog surface for radar analysis. Surface calibration procedures for roughness statistics and empirical backscatter models developed in the Death Valley study will be tested and/or modified for use in the volcanic and sedimentary terrains.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0004, MARS CHRONOLOGY
L.A. Soderblom, U.S. Dept. of the Interior, Geological Survey, Geologic Div., Branch of Astrogeologic Studies, *2255 N. Gemini Dr., Flagstaff, Arizona* 86001 (9580-02369)

During the current fiscal year a new element of the project is being investigated. That is to use Viking Orbiter digital image data to extract precise brightness and albedo profiles and integrated topographic profiles for martian craters as they are being counted. This will provide information on not only the size-frequency distribution or number of craters per unit area in each diameter class, but will also provide information on the distribution of slope and shape. Such information is invaluable in trying to sort out surface processes which are in the process of degrading and obliterating craters and in understanding how complete crater populations are so that they can reflect accurately relative ages. It may also be possible to segregate depositional and erosional processes based on the distributions of shapes of craters as a function of size as well as intensity of such processes.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0005, HYDROGEOLOGIC AND GEOCHEMICAL INVESTIGATION OF THE BOONE LIMESTONE AQUIFER IN BENTON COUNTY, ARKANSAS
A.E. Ogden, University of Arkansas, Fayetteville Campus, School of Arts & Sciences, Dept. of Geology, *Fayetteville, Arkansas* 72701 (A-044-ARK)

The proposed study will make a thorough investigation of the shallow Boone Limestone aquifer of Benton County, Arkansas. The water bearing capacity of the aquifer will be evaluated through pumping test and drillers' information. Well yields will then be correlated with photo-lineaments (fractures) mapped from low altitude BXW (1:20,000) and U-2 color photography.

A piezometric surface map for the Boone aquifer will be prepared for the study area. From this, recharge and discharge areas will be determined as will areas of groundwater mining. Monitoring of water levels in selected wells will enable predictions of seasonal effects to the piezometric surface.

The overall water quality of the aquifer will be determined from extensive well sampling and measurements of major ions and bacteria. Pollution sources will be located, and using geostatistical methods, water quality will be correlated to photo-lineament (fracture) proximity.

SUPPORTED BY U.S. Dept. of the Interior, Office of Water Research & Technology

5.0006, INTERNAL FRICTION AND MODULUS MEASUREMENTS IN ROCKS
B.R. Tittmann, Rockwell International Corp., *1049 Camios Dos Rios, Thousand Oaks, California* 91360 (EAR79-06709)

The high seismic Q in the lunar crust and upper mantle, the uncertainties in the depth-profiles of the temperature and rock composition, the viscosity of the crust, and the non-hydrostatic shape of the moon have raised many related questions which impact the current models of the structure, evolution and thermal state of the moon. This research will shed light on these questions by means of laboratory measurements of the elastic and anelastic properties of rocks representative of the lunar crust and mantle under in-situ conditions and at frequencies and strain amplitudes approaching the corresponding seismic values.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

5.0007, BIOLOGY AND CONTROL OF FOREST INSECTS IN CALIFORNIA
R.H. Smith, U.S. Dept. of Agriculture, Forest Service, Pacific Southwest Forest & Range Experiment Station, *P.O. Box 245, Berkeley, California* 94701 (0000343; PSW-2201)

OBJECTIVE: Determine the ecological effects and develop the methods to assess economic impacts of destructive insects on forest resources of California; develop guidelines and procedures for minimizing adverse effects of such insects and for protecting values and productivity of these resources.

APPROACH: Methods to measure, analyze, and interpret bark beetle population levels are inadequate (dynamics); alternative methods of control for western pine beetle and mountain pine beetle are needed to replace or reduce the use of toxic, broad-spectrum insecticides (behavior); influence of the host on bark beetle fluctuations and the depredations is not understood well enough to be useful for resource management under most conditions (resistance); methods of managing insect pests of coniferous seed, cone, and regeneration are inadequate to insure temporal and spatial success of stand regeneration and to reduce the loss of growth in young stands (regeneration).

PROGRESS: A model for predicting the average level of white fir mortality associated with engravers and borers based on weather and fir growth rate patterns was developed. The preliminary formula, tree resistance equals f (resin quantity, resin quality divided by beetle attack density, beetle quality), was developed from small field experiments with altered individual trees, which accounted for all parameters except beetle quality. The 'trap-out' technique, with a synthetic sex attractant mixture, was used against western pine beetle. Overall effect was a reduction and redistribution in numbers of beetles and severity of damage. Closely related species of Ips showed cross-attraction; distantly related species showed no cross-attraction. OTHER PROGRESS: Preliminary critera were established in developing a risk-rating system for harvesting and thinning true fir. Verbenone, a western pine beetle antiattractant, has adequate potency to protect individual trees. Four systemic insecticides as foliar sprays were not effective in killing Eucosma shoot borer in ponderosa and Jeffrey pine because translocation was from old needles to new needles rather than to pith. A trunk spray of 0.3% lindane emulsion kills many beetles but does not protect the tree. A bivariate regression model permits fitting control points and tree mortality spots from aerial photos of flat terrain to medium scale base maps. (Text Abridged)

SUPPORTED BY U.S. Dept. of Agriculture, Forest Service, Pacific Southwest Forest & Range Experiment Station

5.0008, PHYSICAL PROPERTIES OF THE VIKING LANDING SITES
H.J. Moore, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *345 Middlefield Rd., Menlo Park, California* 94025 (9580-02374)

The objectives of this project are: (1) to analyze data relevant to the physical properties of surface materials at the Viking Landing Sites, Mars, and (2) perform experiments in the laboratory using a Surface Sampler Assembly in materials that simulate the Martian surface materials.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0009, RATES & PROCESSES OF EROSION & SEDIMENTATION IN NATURAL & DISTURBED FORESTED DRAINAGE BASINS IN THE DOUGLAS-FIR REGION OF PACIFIC COAST
R.J. Janda, U.S. Dept. of the Interior, Geological Survey, Water Resources Div., *345 Middlefield Rd., Menlo Park, California* 94025 (WR 74-089)

Most of the timber harvested annually from the Douglas-fir region is taken from virgin forests by clearcutting. Logging and associated road construction significantly increase stream sediment loads, and considerable controversy exists concerning the magnitude and persistence of the impact of present silvicultural practices. Crucial management and legislative decisions concerning forest practices are being made in an atmosphere of considerable public pressure and controversy. Better understanding of

the geomorphic processes operating in this region will provide a more rational basis for pending decisions, and permit objective assessment of the effectiveness of practices proposed to mitigate sedimentation impacts.

The overall objective is to understand better natural rates and processes of erosion as well as the magnitude and persistence of man's impact on those phenomena. The relative importance of mass movement and of fluvial erosion in providing sediment to the streams in different parts of the Douglas-fir region especially needs to be quantitatively documented. This project will collate and study isolated pieces of sediment yield data collected by various government agencies as well as collect new data about processes responsible for observed sediment yields, downstream and downslope impacts of forest practices, and types of sediment transported by streams flowing through areas of differing land use. Special attention is focused on interactions between stream channels, streamside hillslopes, and vegetation.

Available hydrologic, sedimentologic, and slope stability data will be compiled along with factors that control types and rates of erosion processes. Study areas are selected on the basis of available data, personal experience, and inspection of aerial photographs. Erosional phenomena are studied and mapped on aerial photographs and in the field. Landslide activity and channel geometry changes are documented through repeated surveying. Stream sediment loads are measured during storms. Emphasis is given to study sites scheduled to undergo land-use changes, but sites that will remain in a natural state for the foreseeable future are also established as bench-mark stations. Erosion in recently logged basins will be compared with that in less disturbed basins.

We will continue surveys of hillslope erosion and channel geometry at established sites in the drainage basins of Redwood Creek and Mill Creek. (Text Abridged)

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Water Resources Div.

5.0010, PB AND K ISOTOPIC INVESTIGATIONS OF MARE BASALTS AND SOILS

G.R. Tilton, University of California, Santa Barbara Campus, Graduate School, Dept. of Geology, *Santa Barbara, California* 93106 (EAR79-05714)

This study is a continuation of tasks, originally funded by NASA, which have been transferred to NSF. This project involves three separate areas of study: (a) Determination of internal U-Pb isochrons for selected mare basalts, (b) Investigation of possible 39K/41K fractionations in lunar soils, and (c) A study of the isotopic composition of U in the high temperature silicate phases of the Allende chondrite. The studies of the internal U-Pb isochrons for selected lunar basalts should yield better knowledge about the duration of volcanism at the various lunar landing sites, early differentiation history of the moon, the possible role of mare basalts in producing the parentless radiogenic lead found in lunar soils and to detect occurrences of post-crystallization disturbances of the U-Pb systems. The studies of the isotopic compositions of potassium in lunar soils has the potential for answering problems associated with volatilization of selected elements in the lunar environment during heating events. The study of the isotopic composition of uranium in the early condensates found in the Allende meteorite should provide information about early solar system processes (e.g. prior to incorporation into the meteorite).

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

5.0011, STUDY OF BUILDING EFFECTS ON EXHAUST PLUME

R.N. Meroney, Colorado State University, School of Engineering, Dept. of Civil Engineering, *Fort Collins, Colorado* 80523 (NAS 1-15925)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

5.0012, UTAH VISIBILITY STUDY

P. Allee, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab., *Boulder, Colorado* 80302 (RAC40232)

PROJECT OBJECTIVE: 1. Continue baseline measurements of visibility, meteorology and air quality. 2. Evaluate data. 3. Furnish final report.

PROGRESS REPORT: 1. Extremes in visibilities between 285 km and 87 have been observed. 2. A comparison of the photographic technique with the telescopic technique shows that the latter more closely resembles the response of the human eye. 3. No relationship has been found between changes in visibility and human activities.

SUPPORTED BY U.S. Dept. of the Interior, Bureau of Land Management

5.0013, EPOCS AIRCRAFT METEOROLOGY

R.R. Bean, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab., *Boulder, Colorado* 80302 (8C696801)

PROJECT OBJECTIVE: EPOCS consists of two major parts: an oceanographic field study of anomalies of the equatorial Pacific Ocean surface temperature and a study of associated anomalies of the atmospheric circulation. The oceanographic program is designed to utilize NOAA's strengths in ocean measurement, instrument development, and modeling, and, at the same time, to complement the oceanographic research carried out by other groups in the tropical regions. The atmospheric program draws heavily on NOAA's role in weather and climate, empirical modeling with historical data, theoretical modeling with existing General Circulation Models (GCM), and atmospheric observations with satellites and aircraft.

CURRENT YEAR PLAN: 1. To obtain thermal cross-section of the Pacific equatorial currents between 90 degrees W to 145 degrees E concurrently with heat, water vapor and momentum exchange between the sea and the air. 2. To examine the internal structure of the atmosphere on long trade-wind trajectory flights.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Environmental Research Lab.

5.0014, SEISMOLOGICAL OBSERVATORY OPERATIONS AT SOUTH POLE STATION

J. Taggart, U.S. Dept. of the Interior, Geological Survey, *Box 25046, Denver Federal Center, Denver, Colorado* 80225 (DPP78-16676)

The U.S. Geological Survey maintains a seismological station at the South Pole Station. Personnel from the USGS that are responsible for the satellite geoceiver station at the South Pole also operate the seismic station. The grant will support training of the geoceiver operators in the maintainance and operation of the seismographs, basic data reduction and evaluation of the seismic records, and new parts and equipment for the seismometers. The data from the seismological station is used 1) to record earthquakes occurring, not only in the Antarctic Tectonic Plate, but in all areas of the southern hemisphere, 2) to furnish radio earthquake reports daily to Golden, Colorado, for use in the World-wide Epicenter Progran of the USGS, 3) to further delineate continental and oceanic structure of the Antarctic Tectonic Plate, 4) to study propagation of body waves through the mantle and core for earth structure, and 5) to make available to research seismologists the data produced from this uniquely located seismic station.

One qualified electronics technician will make an onsite evaluation of the South Pole seismological station during the 1979-1980 season and make appropriate modifications to upgrade the data.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Polar Programs

5.0015, MINERAL AND ROCK SPECTROSCOPY
G.R. Hunt, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *Box 25046 MS939, Denver Fed. Ctr. Bldg. 25, Denver, Colorado* 80225 (9790-01864)

Project objectives for 1979 are: (a) to record and interpret visible and near infrared spectra of minerals, rocks, soils, and vegetation to determine and explain their characterizing and diagnostic features; (b) to complete construction and testing of prototype portable near-infrared spectrometer and use it in the field to explore any differences from laboratory spectra that occur as a function of the natural environment; (c) to complete testing and then use the aircraft scanner modification to produce images through a variety of bandpass filters to determine the optimum filters for satellite instrumentation; (d) to extend spectral studies further into the mid-infrared and perform emission studies.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0016, NUTATION AND POLAR MOTION OF THE EARTH LAGEOS NUMBER THREE
M.L. Smith, University of Colorado, Boulder Campus, Graduate School, *1200 University Ave., Boulder, Colorado* 80302 (NAS 5-25887)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0017, INVESTIGATION OF IONIZATION EFFECTS IN THE STRATOSPHERE AT HIGH LATITUDES
J.R. Barcus, University of Denver, School of Arts & Sciences, Dept. of Physics, *2115 S. University Blvd., Denver, Colorado* 80210 (ATM79-01183)

This grant will support an investigation of electrical conductivity and related quantities in the polar stratosphere. Previous research has been successful in obtaining baseline measurements by balloon-borne instrumentation over Greenland during a period near solar minimum. During that time, ionization in the middle and lower stratosphere was dominated by galactic cosmic rays. The results obtained, when taken together with relevant measurements of ionization and other electrical parameters, have helped to establish the state of polar stratospheric electricity during a time of relative geophysical calm. This program will concentrate on investigating stratospheric modifications produced at high latitude by transient sources of ionization (e.g., solar protons and nuclear gamma-rays, solar and auroral x-rays) expected to occur frequently near solar maximum. The total program continues to be a joint US/Danish effort involving the University of California (Berkeley), the Technical University of Denmark, and the University of Denver. The overall objective is to understand the electrodynamics of the polar middle atmosphere, especially as it relates to solar-terrestrial coupling.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0018, SEASAT SAR IMAGERY PRODUCTS
I. Jurkevich, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN880325)

To provide ONR/Code 460 designated principal investigators in need of SEASAT SAR imagery products the opportunity to selectively acquire such imagery in limited quantities, suitable for supporting their specific research programs and objectives.

Acquire selected raw data frames of the SEASAT SAR experiment as received at the NASA STADAN STES, process them in the NRL Digital Image Processing Laboratory (DIPL), and offer them to the user community in one of the following forms: computer compatible tapes (CCT), hard copy imagery (HCI) (film products), or a combination of both. The DIPL will also attempt to furnish enhanced hard copies of the imagery per user specifications. Enhancement options include linear and nonlinear grey scale stretching or compression, brightness contouring, edge or line enhancement, color mapping, color composites, magnetization mosaicing binarization, histogram construction, annotation and pixel by pixel manipulation and read-out throughout an image scene.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0019, MARINE ATMOSPHERE (NORSEX)
L. Ruhnke, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN980184)

There is a three-fold objective of this research. The first is to provide a well documented marine data base to further refine the existing relationship between standard marine meteorological observations and the vertical water distribution under various cloud conditions. The second is to provide a test set of non-fair-weather total precipitable water content data in the vertical column to compare with similar data deduced from algorithms of both satellite and aircraft multichannel passive microwave radiometer measurements. The third is to provide a survey involving both the vertical distribution of CCN and water vapor to ascertain the suitability of certain platforms in the North Sea to serve as transmission paths for long term GEOMET studies.

Full advantage will be taken to exploit the large amount of marine meteorological data which will become available on a cooperative basis from the international NORSEX Project. Aircraft flights will be made during a 3-week period in March 1979 off of the southwestern coast of Norway. These flights will provide soundings of water vapor, liquid water and cloud condensation nuclei concentrations which, when coupled together with the reduced data from the other investigators, will provide the information necessary to fulfill the three-fold objective of the project.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

5.0020, RAPID INTERPRETATION OF AIRCRAFT SCANNER DATA USING COMPUTER INTERACTIVE SYSTEMS
Ealy, U.S. Dept. of Transportation, Federal Highway Admin., *400 7th St. S.W., Washington, District of Columbia* 20590 (153631 (HRB NO.))

Multispectral aircraft scanner tapes of the Tampa, Florida bypass (I-75) will be analyzed to classify the salsand geology. Results will be compared to conventional mapping methods for accuracy and cost effectiveness.

SUPPORTED BY U.S. Dept. of Transportation, Office of Research, Materials Div.

5.0021, PROJECT AIRSTREAM
A.J. Calio, U.S. National Aeronautics & Space Admin., *600 Independence Ave. S.W., Washington, District of Columbia* 20553 (6807; EX-76-A-28-3152)

The objective is to document the concentrations of selected aerosols and gases in the stratosphere and upper troposphere as a function of latitude, altitude and season in the northern hemisphere. Project Airstream uses a WB-STF aircraft as a sampling platform. Missions are flown in spring, summer and fall. The latitude coverage extends from 75 degrees N to the equator. Four altitudes are sampled, ranging from 40K ft to 63K ft. Vertical profiles at Panama, Alaska and Texas provide tropospheric samples. Filters and whole air samples are analyzed by the DOE Environmental Measurements Laboratory or subcontractors. Tritium analysis is done by the University of Miami. Interpretative analysis of data is done by EML and the Air Resources Laboratory, NOAA.

SUPPORTED BY U.S. Dept. of Energy, Office of Health & Environmental Research

5.0022, PLANNING THE MONEX/OCEANOGRAPHY PROGRAM
D.W. Moore, Nova University, Fort Lauderdale Campus, Ocean Sciences Center, *Fort Lauderdale, Florida* 33314 (ATM79-07889)

The purpose of this grant is to continue to provide funds for the planning and implementation of the oceanographic component of the Monsoon Experiment (MONEX). This will include continued support of the MONEX/Oceanography Project Office (previously called the Indian Ocean Experiment (INDEX) Office) at Nova University and meetings of the MONEX/ Oceanography Organizing Committee (previously called the INDEX Organizing Committee). The INDEX, a pilot research project that was conducted during FY 1975-1977 has successfully developed the oceanographic part of MONEX and so the program is now called MONEX/ Oceanography. Although field work has continued since the inception of INDEX, during this year the major and most coordinated field activities will take place.

The MONEX is a major study to increase our knowledge and understanding of the dynamics and thermodynamics of the atmosphere and the ocean in monsoon regions. The major objective of MONEX/ Oceanography is to understand the time-dependent response of the Indian Ocean to the wind forcing due to the monsoons, and the nature of the feedback that the ocean produces on the monsoon regime itself. MONEX is important scientifically and also has significance in global agriculture, economics and politics. The NSF is responsible for supporting the costs of research, logistics, equipment and management of U.S. participation in MONEX which is a regional subprogram under the Global Atmospheric Research Program (GARP).

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

5.0023, WETLANDS DELINEATION, CENTRAL VOLUSIA COUNTY

P.W. Bush, U.S. Dept. of the Interior, Geological Survey, Water Resources Div., *Orlando, Florida* (FL 76-260)

Volusia County on the Florida central east coast plans development of a central supply well field in a limestone aquifer that is overlain by a water-table sand aquifer. The two aquifers are hydraulically connected and, under natural conditions both are full and lose potential recharge to runoff and ET. Well field development will divert part of the rejected water to recharge; changes in the amount of wetted land area and/or vegetation may also occur. The county would like to be in a position to document those changes in the wetlands caused by pumping and those due to natural hydrologic fluctuations.

Document pre-well field vegetation and shallow aquifer water-level conditions in the approximately 150-square-mile potential recharge area of central Volusia County; also relate shallow aquifer hydrology to the various plant communities.

Construct a series of vegetative maps of the central wetlands area using low-level color aerial photos and field reconnaissance. Establish a network of shallow aquifer wells and staff gages to document seasonal water level fluctuations relative to land surface in the various plant communities. An attempt will be made to use LANDSAT imagery to document the seasonal variation in percentage of wetted land surface.

The vegetative mapping was completed as was the text and illustrations for the WRI map. Report 70 percent completed. Preparation for publishing the vegetative maps on the 1:24,000 scale with text is about 70 percent complete.

SUPPORTED BY U.S. Dept. of the Interior, Geological
Survey, Water Resources Div.

5.0024, MEASUREMENTS OF AEROSOL OPTICAL PROPERTIES AS A PART OF THE GAMETAG PROGRAM

G.W. Grams, Georgia Inst. of Technology, School of Geophysical Sciences, Dept. of Meteorology, *Atlanta, Georgia* 30332 (ATM7810091)

The objective of this project is to provide an initial assessment of concentrations and types of natural airborne aerosol particles. This will be achieved by analysing the tropospheric aerosol data collected with the NCAR Electra aircraft during the GAMETAG field program. During the data analysis, particular emphasis will be placed on the properties of the particulates that are of importance in determining their effect on the radiative balance of the atmosphere and thereby on the earth's climate.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

5.0025, STUDIES OF IONOSPHERIC SCINTILLATION PROBLEMS

C.H. Liu, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Electrical Engin, *207 Engineering Hall, Urbana, Illinois* 61801 (ATM77-22485)

Recent coordinated observations have now provided a sufficiently meaningful data base defining the equatorial ionospheric irregularities that quantitative modeling is possible. One of the most striking results is the Jicamarca incoherent scatter observation of plume like structures which now have led many to view the instabilities as due to instabilities associated with upwelling of depleted plasma density regions (bubbles) from the lower F regions. Radar, in situ, and scintillation data provide a broad spectral picture of the phenomenon.

This grant will fund the processing and analysis of this data with emphasis on the possible link to the phenomenon of rising bubbles. Preliminary calculations for the satellite transmission data base have shown one a priori viable hypothesis, ducting in the field aligned bubbles, to be unlikely; while another hypothesis, multi-path type refractive scattering at the extreme sharp density gradients at the 'walls' of the bubbles, appears feasible. This will be examined in detail. It has been suggested that a hierarchy of instabilities may be operative during equatorial spread F to produce the full wave number spectrum of irregularities. The modeling will test scintillation dependence for a multi-frequency (amplitude and phase) data base.

SUPPORTED BY U.S. National Science Foundation, Div. of
Atmospheric Sciences

5.0026, PREPROCESSING AND ANALYSIS OF GEOPHYSICAL REMOTE-SENSING DATA

P.E. Anuta, Purdue University, Lab. for Applications of Remote Sensing, *West Lafayette, Indiana* 47906 (ENG78-20466)

This research effort addresses the problem of preprocessing and analysis of geophysical remote sensing data which carries information on the subsurface nature of the earth rather than surficial phenomena. In part one of the problem, information derived from aeromagnetic gravity and gamma ray sensor sources is examined to define methods for placing this data in a uniform multivariate grid format for input to analysis algorithms. In part two, research on methods of analysis of the multi-image geophysical data is conducted to define algorithms and analysis steps which will transform a geophysical sample vector into an information quantity relating to the presence of mineral and other subsurface resources.

This research is a continuation of a program previously supported under NSF grant ENG-7614400.

SUPPORTED BY U.S. National Science Foundation, Div. of
Engineering

5.0027, ELECTROMAGNETIC BACKSCATTERING AND EMISSION FROM VEGETATION AND SNOW

A.K. Fung, University of Kansas, Lawrence Campus, School of Engineering, Dept. of Electrical Engineering, *Learned Hall, Lawrence, Kansas* 66044 (ENG79-09374)

This research effort is directed toward an investigation of the interaction of electromagnetic energy and natural terrains such as vegatation cover, snow cover, or ice cover. Theoretical studies are being carried out to establish backscatter and emission models for inhomogeneous media with irregular boundaries, illuminated by microwave remote sensing systems. The scatter models are designed to account for both polarized and corss-polarized returns observed in reported measurements, while the emission models are designed for both vertical and horizontal polarization. In addition, the theoretical studies explore the relative importance of the contributions from volume

and surface scattering mechanisms to the total backscattering coefficient or brightness temperature.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

5.0028, LAND COVER MAPPING USING REMOTE SENSING IMAGERY
M.D. Ashley, University of Maine, Orono Campus, School of Forest Resources, McIntire Stennis Program, *302 Boardman Hall, Orono, Maine* 04473 (0074928; ME09614)

OBJECTIVE: Common forest cover base data needs between forest resource managers and other natural resource managers in Maine at the private, state and federal levels will be identified and then remote sensing imagery and techniques will be evaluated to find which of these can be used to satisfy these common data needs.

APPROACH: The common forest land cover base data needs will be identified through interviews with state, private and federal forestry personnel. After analyzing these interviews, a common compatible system of forest land cover codes will be developed. LANDSAT satellite, small scale aircraft and conventional scale imagery will then be studied to find which of these can most accurately and efficiently provide the needed common cover data.

PROGRESS:

SUPPORTED BY U.S. Dept. of Agriculture, Cooperative Research Office, Maine

5.0029, WETLAND SOILS AND DRAINAGE MAPPING USING AIRBORNE SENSING TECHNIQUES
Breault, General Electric Co., *5030 Herzel Pl., Beltsville, Maryland* 20705 (192782 (HRB NO.))

Objectives of study are to demonstrate and document the cost-effectiveness of using remote sensing methodology to map wetlands engineering soils data.

SUPPORTED BY U.S. Dept. of Transportation, Office of Research, Materials Div.

5.0030, SEASAT-PROGRAM - 'DETERMINING THE UTILITY OF THE SEASAT-A SYNTHETIC APERTURE RADAR FOR OCEAN WAVE DETECTION'
R.C. Beal, Johns Hopkins University, Applied Physics Lab., *Johns Hopkins Rd., Laurel, Maryland* 20810 (7-973; MO-A01-78-00-4330)

OBJECTIVE: Determine performance range over which SEASAT-SAR accurately measures predominant ocean wavelengths and direction and find the small gravity wavelength region for which the isotrophic roughness modulation model is most valid. Results contribute to definition of optimum radar wavelength choice for future oceanographic satellites.

APPROACH: Data will be collected from each of the three to five test sites and recorded simultaneously with the SEASAT-A overflights during the first six months. Then the data from each of the sensors will be converted to a useful format for sensor cross-correlations, primarily involving optical Fourier transform effort. The last phase will involve data analysis and reporting in which correlations between sensors and optical Fourier transform data are examined for significant implications.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Environmental Satellite Service

5.0031, SENSOR DEVELOPMENT FOR BASIC SURFACE OBSERVATIONS - CEILING
D.T. Acheson, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Weather Service, Systems Development Office, Equipment Development Laboratory, *8060 13th St., Silver Spring, Maryland* 20910 (8AA8104)

OBJECTIVE: To develop a laser ceilometer which doesn't have the problems of procurement, installation and maintenance that the RBC has.

APPROACH: To continue work on three systems: 1. Pulsed Laser Ceilometer: a. To evaluate the Sperry RVR/CBHI Navy instrument as a ceilometer and RVR Sensor, interfacing it with digital recording equipment at T&ED. b. To design and fabricate a digitally modulated continuous wave HeNe or GaAs laser ceilometer. c. To follow commercial progress in laser ceilometer development. 2. Continuous Wave (CW) Laser Ceilometer: Using pulse compression techniques on receive, develop a system around digitally modulated, commercially available Helium-Neon or near-Infrared source. 3. Stereo Radiometer: a. Develop data processing and display techniques for the acquisition of cloud data in stereo. b. Evaluate the Stereo Radiometric Measurement on cloud distributions varying from simple to complex, using an 'all-sky' camera for ground truth.

SUPPORTED BY U.S. Dept. of Commerce, National Weather Service, Systems Development Office

5.0032, MICROCRACKS IN LUNAR ROCKS
M.G. Simmons, Massachusetts Inst. of Technology, School of Science, Dept. of Earth & Planetary Sciences, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (EAR79-07033)

This is a project to study the microcracks in lunar rock samples. During the grant period the following tasks will be accomplished: 1. Measure the effects of thermal cycling on microcracks in rocks. Use the results to determine whether the microcracks in returned lunar samples have been affected significantly by thermal cycling. 2. continue to develop the technique of observing microcracks in samples that are stressed in the SEM. Examine the cracks in several lunar samples with this technique. 3. Determine, if possible, whether the microcracks in returned lunar samples are representative of the microcracks of samples in situ buried in the Moon. 4. Continue to reconnoiter cracks that are present in lunar samples. 5. Continue to develop methods of characterizing cracks in rocks. 6. Interpret the observational data on cracks in terms of: a. the processes that have operated on each lunar sample, b. the intensity of the processes, c. the distribution with depth in the Moon of crack spectra of lunar rocks, and d. the variation with depth of various physical properties of rocks in the Moon. 7. Report the results in the usual scientific journals and in summary form in an annual report to NSF.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

5.0033, PETROLOGICAL AND MINERALOGICAL STUDIES
U. Marvin, Smithsonian Institution, Astrophysical Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (31P-4P50-02)

In an effort to better understand the distribution of elements in materials of the early solar system, a project was begun to correlate mineralogy with rare earth elements in the Allende meteorite. Forty-six selected particles from the meteorite were analyzed for minor elements by neutron activation at the University of Oregon and returned to me for petrographic study by use of optical microscopes, X-ray diffraction, and the electron microprobe. Most of this work will be done in the coming year.

SUPPORTED BY Smithsonian Institution, Astrophysical Observatory

5.0034, LAND USE CHANGE IN CARROLL COUNTY, GEORGIA
J.F. Hart, University of Minnesota, Minneapolis Campus, School of Liberal Arts, Dept. of Geography, *322 Johnston Hall, Minneapolis, Minnesota* 55455 (G-12)

STATE TO WHICH PROJECT PERTAINS: Georgia.

Through use of air photos, maps, and field research, the changing patterns of land use in Carroll County, Georgia are being studied.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Land Information & Analysis Office

5.0035, SURVEY TECHNOLOGY

A.J. Kemmerer, U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Marine Fisheries Service, Southeast Fisheries Center, *Bay St. Louis, Mississippi* 39520 (SEC-207)

Overall objective is to provide technical options for achieving NMFS goals through satellite and remote sensing applications, development of sampling and data management systems, programs planning (system engineering), and technology transfer and coordination. Satellite studies include SEASAT-A surface layer transport and fisheries surveillance, CZCS fishery applications, satellite tracking of porpoises and marine turtles, and development of satellite image analyses; remote sensing applications include photography and LLLTV demonstrations, remote mapping of submerged sea-grasses and support of RUFAS-II; sampling systems include turtle and porpoise tags, turtle tracking, and development of trawl door ST. Data management efforts relate to EPA studies, SEFC data, and optimized cruise tracks. Program planning includes SEFC turtle PDP support, and planning support for NOAA. Technology transfer and coordination impacts the national focus of NFEL and includes NOAA technical management of CZCS program, NMFS coordination of SEASAT projects, support of ICES aerospace remote sensing group, and participation in IOCARIBE and MEXUS. Program and project activities normally involve cooperative investigations with technology related research agencies (e.g., NASA, U.S. Navy, etc.), and user groups (e.g., fishing industries, EPA, BLM, Fish & Wildlife Service, etc.). Emphasis is on planning, coordination, and analysis and evaluation of results for NMFS application.

SUPPORTED BY U.S. Dept. of Commerce, National Marine Fisheries Service, Southeast Fisheries Center

5.0036, TROPHIC CLASSIFICATION OF LAKE MEAD UTILIZING CONTACT AND LANDSAT DATA

D.H. Boland, U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Systems Lab., Water & Land Quality Branch, *P.O. Box 15027, Las Vegas, Nevada* 89114 (J613A-022)

OBJECTIVE/APPROACH: The general objective is to determine the utility of LANDSAT multispectral scanner data for the investigation of the spatial-temporal aspects of trophic indicators and trophic state in a large lake (Lake Mead). Specific objectives include: 1. Development and evaluation of models to predict the magnitude of selected trophic indicators. 2. Development and evaluation of models to predict the trophic state of a lake. 3. Generation and evaluation of thematic photomaps which depict trophic indicator magnitudes and trophic index values within a lake.

Water quality data were collected from Lake Mead on 8 different dates during 1976 concurrently or near-concurrently with LANDSAT and NASA aircrafts. Remotely sensed data were acquired by multispectral scanners and aerial mapping cameras. Multispectral data from 20 LANDSAT scenes are being compared with water quality data obtained from some 40 lake sampling sites and, if statistically significant relationships are found, thematic photomaps will be generated. The maps will display the temporal-spatial aspects of trophic indicators and a trophic index.

FINAL OUTPUT: A report will be written describing the project results for use by other EPA, Federal, and State Agency monitoring personnel.

PROGRESS: Significant correlations between remote data and Water Quality parameters have been identified.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Systems Lab.

5.0037, DEVELOP LASER FLUOROSENSORS FOR MONITORING SURFACE WATER CHLOROPHYLL A

M. Bristow, U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Systems Lab., *P.O. Box 15027, Las Vegas, Nevada* 89114 (J884A-045)

OBJECTIVE: Develop an airborne laser fluorosensor capable of measuring and mapping surface water chlorophyll A concentrations and monitoring fluorescent tracing dyes. By making repeated passes in a fixed or rotary wing aircraft, produce a map of chlorophyll fluorescence-to-water Raman ratio for use as an indicator of surface water chlorophyll A concentration.

APPROACH: The airborne laser fluorosensor employs a flashlamp pumped dye laser tuned to the absorption peak of chlorophyll A. The laser-induced fluorescence is collected by a telescope and focussed onto a detector. Correction for variation in water transmission is made by monitoring the laser-induced water OH stretch Raman band. The signal is displayed on a CRT, digitized and recorded on magnetic tape.

PROGRESS: The system is currently being evaluated in a helicopter, at the height of 1000 ft. above the water surface. Good signal-to-noise ratios are obtained for surface chlorophyll concentrations of the order of 1 microgram/l Raman-corrected fluorescent returns correlated with surface water values for chlorophyll concentrations as obtained using in situ measurements.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Systems Lab.

5.0038, AIRBORNE AIR QUALITY MEASUREMENTS SYSTEMS DEVELOPMENT

J. van Ee, U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Systems Lab., *P.O. Box 15027, Las Vegas, Nevada* 89114 (J763A-05)

OBJECTIVE: Design and test-fly an airborne air quality measurements system that can be easily moved from aircraft to aircraft. The system is to be as compact and lightweight as possible with minimum electrical power requirements, and be tailored to withstand the vibration and rapid temperature and pressure changes in aircraft. The system should reduce costs and inflexibility currently associated with dedicated air quality measurements aircraft.

APPROACH: Develop an instrument package for measurement of temperature, dew point, altitude, position, ozone, particulates, and oxides of nitrogen which can be quickly installed in the nose and cabin areas of a small twin-engine private plane. Existing air pollution instruments will be modified in varying degrees and miniaturizing electronics employed to achieve a small lightweight system.

PROGRESS: The design phase has begun.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, Environmental Monitoring & Systems Lab.

5.0039, REMOTE ICE THICKNESS AND STRENGTH DETERMINATION

A. Kovacs, U.S. Dept. of Defense, Army, Corps of Engineers, Cold Regions Research & Engineering Lab., *P.O. Box 282, Hanover, New Hampshire* 03755 (DA0C8144)

The technical objective is to evaluate remote sensing techniques for detection of ice thickness and strength. The purpose is to provide methodology which can be used by the Army in the field for determining if an ice sheet (river, lake or sea) will support tactical vehicles. Information will be transferred to other government agencies.

The approach will be to evaluate electromagnetic methods for measuring ice thickness and physical properties which can be used to evaluate the bearing capacity of a desired ice crossing by military vehicles. This will include the evaluation of platforms needed to transport the remote sensing equipment. From this evaluation system concepts for determining, by remote techniques, the trafficability of an ice sheet will be developed.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Cold Regions Research & Engineering Lab.

5.0040, TURBULENCE AND TURBULENT DISPERSION FOR A TWO-DIMENSIONAL SIMULATED BAROCLINIC ATMOSPHERIC MODEL

R.L. Peskin, Rutgers the State University of New Jersey, New Brunswick Campus, School of Engineering, Dept. of Mechanical Industrial & Aerospace Engineering, *Old Queens Bldg., New Brunswick, New Jersey* 08903 (ATM7901694)

The objective of this research is to study processes controlling turbulence dispersion in large scale atmospheric motions. A two-dimensional numerical simulation model will be constructed by using equatorial heating, polar cooling, and an appropriate thermal energy equation. Turbulent structure will be investigated with emphasis on energy and momentum flux balances.

Lagrangian particle tracking will be employed to study single point and relative two-point dispersion. Data from the First GARP Global Experiment (FGGE) balloon releases will be used to study single and two-point Lagrangian separation processes. These data will be compared to similar studies of previous balloon releases as well as the numerical simulation results.

Atmospheric diffusion and turbulence processes are difficult, but very important areas of atmospheric science. An increased understanding of these processes is necessary in order to overcome a major obstacle in our efforts to improve medium- and long-range weather predictions.

This is a new award for continued work on a previously funded project.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0041, LONG RANGE AIR QUALITY EFFECTS STUDY (FORMERLY PROJECT DAVINCI)

B.D. Zak, Sandia Lab., *P.O. Box 5800, Albuquerque, New Mexico* 87115 (1520; EY-76-C-04-0789)

The primary objective of the Long Range Air Quality Effects Study is to provide the information necessary to describe the large scale regional (50 to 1000 km) and subcontinental scale air quality problems associated with NEP scenarios. The primary approach of the project is to conduct studies of the pollutant transport and transformation in a Lagrangian mode utilizing an instrumented superpressure balloon in the vicinity of the source. The balloon provides a Lagrangian marker of the air mass volume. Spatial mapping about the balloon of pollutants and meteorology would be conducted using instrumented aircraft. Another facet of the project will include using the automated data collection package suspended by a helicopter to conduct close-in sampling of plumes.

SUPPORTED BY U.S. Dept. of Energy, Office of Health & Environmental Research

5.0042, NATURAL AND ARTIFICIAL INFRASOUND AS AN ATMOSPHERIC PROBE

W.L. Donn, Columbia University, Lamont Doherty Geological Observatory, *Palisades, New York* 10964 (ATM79-08350)

Interfering ocean waves radiate continuous infrasound into the atmosphere. Also, infrasound is generated during the supersonic part of the many daily flights of the Concorde aircraft. This grant funds the recording of these sounds at long range on arrays of sensors after the signal has been refracted through the upper atmosphere. This remote, inexpensive, passive probe of the atmosphere provides information on the speed and direction of the winds in the stratosphere and lower thermosphere. The continuous signal from sea waves and the regular signal from the Concorde will be digitally recorded to develop a procedure for providing a continuous monitor of the upper atmosphere. The digital analysis will: (1) increase the resolution of wind determinations, particularly when more than one infrasound source is present; and (2) decrease the time required to obtain results in a large-scale operation.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0043, DEVELOPMENT OF A 0.4 TO 2.5 MICRON SPECTRORADIOMETER INSTRUMENT SYSTEM FOR AIRBORNE REMOTE SENSING

J.T. Kuo, Columbia University, School of Mines, Dept. of Mining Metallurgical & Mineral Engineering, *Broadway & W. 116th St., New York, New York* 10027 (ENG78-24432)

The objective of this research is to assemble a variety of "off-the-shelf" electronic components such as detectors and data processing units into an airborne remote sensing instrument capable of high resolution measurements of the in-situ spectral properties of geologic materials and botanical overcover.

The system uses parallel optical input to all spectral channels with a simultaneous spectral range of 0.4 to 2.5 microns. The detector module uses a 512 channel silicon diode linear array to cover the 0.4 to 1.4 mm bandwidth. A 48 element lead sulphide detector array covers the 1.1 to 2.5 micron region with variable bandwidths having the greatest spectral resolution in the 2.0 to 2.5 micron region. Dispersion optics are designed to display the digital form in real-time and stored on computer compatible tapes. Continuous and automatic data acquisition is allowed during airborne operations and a motorized 35 mm camera to record ground track and a CRT display to allow real-time monitoring are included features.

SUPPORTED BY U.S. National Science Foundation, Div. of Engineering

5.0044, DATA ACQUISITION AND PATH SELECTION DECISION-MAKING FOR AN AUTONOMOUS ROVING VEHICLE

S.W. Yerazunis, Rensselaer Polytechnic Inst., School of Engineering, Dept. of Chemical & Environmental Engineering, *110 8th St., Troy, New York* 12181 (NASW 3279)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Office of Aeronautics & Space Technology

5.0045, SPECTROSCOPIC INVESTIGATION OF THE UPPER ATMOSPHERE IN THE PLASMAPAUSE REGION

J.S. Kim, State University of New York, Albany Campus, School of Science & Mathematics, Dept. of Atmospheric Science, *1400 Washington Ave., Albany, New York* 12222 (ATM78-05739 A02)

This grant funds a program for collecting and analyzing data which will allow extension of our understanding of important transport and dynamical effects in the sub-auroral upper atmosphere. The program incorporates a 6-inch high-resolution Fabry-Perot interferometer system designed to achieve high optical throughput while maintaining high resolving power. For the next 18 months, a period encompassing the International Magnetospheric Study (IMS) and the maximum activity years of the current solar cycle, the instrument will measure temperatures and neutral winds through Doppler interferometric measurements of the atomic oxygen emission line at 6300A. This will be observed in nightglow, aurora and SAR arcs from a field station in the vicinity of Albany, New York. In addition, observations will be made of the atmospheric emissions associated with precipitating particles (5577A, 6300A, 4278A, and 4861A) and of SAR arcs (6300A) in the vicinity of the plasmapause and the underlying neutral atmosphere by means of a multicolor airglow photometer which sweeps along the geomagnetic meridian plane of the observing station. These measurements are to be closely coordinated with the operation of the Millstone Hill incoherent-scatter radars which are located in Westford, Massachusetts. The program emphasis will be on collecting and analyzing data on the neutral winds in the same thermospheric volume as probed by the Millstone Hill radar. It is notable that both Westford and Albany lie near the plasmapause transition, and that the upcoming solar activity maximum is expected to be a large one, possibly comparable to the 57-58 maximum, the strongest in recent history.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0046, ACQUISITION OF A SCANNING ELECTRON MICROSCOPE

W.J. Meyers, State University of New York, Stony Brook Campus, School of Arts & Sciences, Dept. of Earth & Space Sciences, *Stony Brook, New York* 11790 (EAR78-22444)

The scanning electron microscope will be used in the fields of paleobiology, carbonate diagenesis and sedimentology, lacustrine and associated terrestrial sedimentology, evaporite diagenesis, geochemistry, and lunar rock surface studies. Also the instrument will be used as a teaching and research tool for advanced undergraduates, graduate students and faculty. In general, the instrument will provide a facility that can be used to do much of the groundwork micro-petrography on many types of samples that will be analyzed on the STEM, analogous to doing careful light petrography before electron microprobe analyses.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

5.0047, AIRCRAFT OPERATIONS

R.W. Garber, U.S. Dept. of Energy, Brookhaven National Lab., *Upton, New York* 11973 (002355; EY-76-C-02-0016)

A twin-engine aircraft has been leased for exclusive use to carry out research projects which are part of the Atmospheric Sciences programs at Brookhaven National Laboratory (BNL). The aircraft is used for atmospheric sampling and analysis experiments. Routine observation of the horizontal and vertical distribution of pollutants which are conducted for the MAP3S program require about one-half of its scheduled flight time. Plume studies which are part of the MAP3S program require about one-quarter of the scheduled flight time. The remaining scheduled flight time is used principally for cooperative atmospheric studies with observation teams from other organizations which are part of the MAP3S program. Other BNL Atmospheric Sciences programs may obtain flight time on this aircraft on a cost-recoverable basis. For certain studies which are conducted for the MAP3S program and for other Atmospheric Sciences programs, utilization of a second small aircraft is necessary. Additional aircraft will be obtained on a short-term rental basis and outfitted with easily-installed equipment for the purposes of the specific study. As part of Aircraft Operations, a program of equipment testing, calibration, and modification is required to maintain an effective atmospheric sampling and analysis system for the aircraft.

SUPPORTED BY U.S. Dept. of Energy, Office of Health & Environmental Research

5.0048, CUYAHOGA COUNTY CENTRALIZED MANAGEMENT AND INSTRUMENTATION, MONITORING AND PROCESS CONTROL STUDY

S.J. Sebesta, Cuyahoga County Sanitary Engineering Dept., *75 Public Sq., 2nd Floor, Cleveland, Ohio* 44113 (R806330; C821B-02TD44)

OBJECTIVE: The objective of this research is to evaluate the cost benefits of low-cost field-proven sensors and telecommunication equipment in monitoring package sewage treatment plants.

APPROACH: EPA/MERL-WRD has developed a centralized management model for operating a group of small treatment plants. The model will be calibrated using field data and implemented at Cuyahoga County, Ohio.

PROGRESS: The grant was processed in August 1978. Cuyahoga County has selected a contractor to aid in procurement and installation of the remote sensors.

SUPPORTED BY U.S. Environmental Protection Agency, Office of Research & Development, *Municipal Environmental Research Lab.*

5.0049, SATELLITE IMAGERY ANALYSIS OF MEDITERRANEAN SEA

J.J. Gallagher, U.S. Dept. of Defense, Navy, Naval Underwater *Systems Center, Newport, Rhode Island 02840 (DN989003)*

Use available data to locate and characterize ocean fronts in the Mediterranean Sea. Determine spatial and temporal changes of frontal locations and relative radiative sea surface temperature (SST) gradients.

Using the unique data set of available NOAA very high resolution (VHRR) enhanced visible and infrared satellite imagery and the NUSC (code 343) optical microdensitometer determine relative SST gradients referenced to calibrated gray shade wedges. Translate the locations and SST gradient information to a standardized base map in a color scheme related to the STEPU wedge. These data could be animated for follow-on investigations of adjective frontal dynamics. Use the archival data processing and display capability at the Saclant ASW Centre, U Laspezia, Italy to determine the in-situ density and sound velocity structures of the observed thermal frontal features; this effort will also identify those regions where in-situ environmental data are lacking.

SUPPORTED BY U.S. Dept. of Defense, Navy, Naval Material Command

5.0050, STABILITY OF NAVIGATIONAL CHANNELS AND SHOALING IN SOUND ENTRANCES, SOUTHERN HALF OF THE SOUTH CAROLINA COAST

M.O. Hayes, University of South Carolina, School of Science & Mathematics, Dept. of Geology, *Admin. Bldg., Room 115, Columbia, South Carolina* 29208 (R/CZ-2)

OBJECTIVES: 1. Determine historical changes of navigable tidal creeks and rivers in South Carolina salt marshes. This would include location of unstable, eroding portions as well as those areas prone to rapid shoaling. 2. Incorporate data on migration of tidal inlets generated by USC-Coastal Research Division Sea Grant Project of 1977-78. 3. Carry-out an historical analysis of inlet migration (using sequential aerial photographs) for all major tidal inlets south of Charleston Harbor, not already included in this year's (1977-78) inlet study. 4. Determine channel stability at the entrances to St. Helena and Port Royal Sounds.

ANTICIPATED BENEFITS: 1. Location of problem areas and variability of tidal channels in salt marshes should aid in coastal zone management. 2. Provide a basis for decision-making regarding building of coastal structures, (e.g., jetties), dredging permits, set-back lines, etc. 3. Location of stable channel configurations will aid in the logical development and maintenance of dredging programs. 4. Determination of shoaling behavior within the sounds should aid in eliminating navigational problems.

IDENTIFIED BENEFITS TO DATE: Information gained through this project is being used by the principal investigator to formulate advice on several questions raised by the Coastal Commission of the State of South Carolina.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., Sea Grant Office

5.0051, RESOLVING THE AGRICULTURAL/RESIDENTIAL IMAGE CLASSIFICATION CONFLICT

E.D. Miller, Texas A & M University, College Station Campus, Graduate School, *College Station, Texas* 77843 (NAS 5-25846)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0052, SEASAT PROGRAM - DETERMINATION OF A PRECISE SEASAT EPHEMERIS AND OCEAN TOPOGRAPHY USING LASER & ALTIMETER MEASUREMENTS FOR MODEL IMPROVEMENTS

R.E. Schutz, University of Texas, Austin Campus, School of Engineering, Dept. of Aerospace Engineering & Engineering Mechanics, *200 W. 21st, Austin, Texas* 78712 (7-928; MO-AO1-78-00-4325)

OBJECTIVE: Determination of a continuous long duration orbit using lasers and altimeter data, resulting in an improved force model for use in determining SEASAT orbits at other times.

APPROACH: To achieve the objective, a simultaneous solution which includes a set of epoch orbital elements, a set of time-dependent atmospheric resistance parameters, a set of time-dependent solar radiation pressure parameters, a set of parameters associated with other non-gravitational forces, a truncated

set of geopotential coefficients, measurement model parameters, and other parameters deemed necessary as the result of preliminary studies will be obtained. The approach will be to use a single continuous dynamically consistent orbit of as long as possible to ensure uniform sampling of the oceanic surface by the altimeter. In addition, the reference equipotential surface will be completely consistent with the geopotential used for computing the orbit and will be close to the geoid.

SUPPORTED BY U.S. Dept. of Commerce, National Oceanic & Atmospheric Admin., National Environmental Satellite Service

5.0053, THEORETICAL AND OBSERVATIONAL STUDIES OF NEUTRAL ATOM PRECIPITATION

B.A. Tinsley, University of Texas, Dallas Campus, Center for Space Sciences, *Richardson, Texas* 75082 (ATM79-13211)

This grant will permit measurements of optical emissions due to the precipitation of energetic neutral atoms into the middle and low latitude upper atmosphere at McDonald Observatory (W. Texas, Magnetic dip latitude 40 degrees), Mt. Haleakala (Maui, Hawaii, magnetic dip latitude 22 degrees), and Huancayo Peru (magnetic dip latitude 0.6 degrees). Precipitating hydrogen, helium and oxygen atoms originate at several earth radii when the parent ring current ions capture an electron from geocoronal hydrogen atoms. The influx is strongest during main phases of large geomagnetic storms, and the ionization produced by it can be an order of magnitude greater than normal at night in the upper E region. Even at quiet times the influx and ionization production is non-zero. During storms there may be significant heating effects at middle and low latitudes.

Theoretical work on the subject of energetic neutral precipitation will also be undertaken. Thus far, the only calculation with the correct physics is for a two-dimensional approximation, and it only yields the latitude variation of the influx. New three-dimensional calculations will be made. Height profiles of energy deposition and ionization production in the ionosphere will then be calculated, and the efficiency of production of the low altitude equatorial belt of trapped particles.

The observations would be made for at least two years with emphasis on magnetic storm periods, but also during moderately distubed and quiet condition. The observation period (mid 1979-mid 1981) would include the approaching solar maximum period. The observations will serve to test the models and provide a measure of the total energy input rate for the neutral atom precipitation process.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

5.0054, PLANNING, IMPLEMENTATION, EVALUATION OF REMOTE SENSING (PIERS)

D.E. Lichy, U.S. Dept. of Defense, Army, Corps of Engineers, Coastal Engineering Research Center, *Kingman Bldg., Fort Belvoir, Virginia* 22060 (31581)

OBJECTIVE(S): To plan, implement and evaluate the state-of-the-art of remote sensing technology related to coastal engineering. Although the use of remote sensing techniques has been utilized to a high degree in various technical disciplines, the application in coastal engineering has lagged because of a lack of a coherent plan and guide for use by coastal engineers and scientists.

APPROACH: Review research related to coastal engineering and implement where applicable remote sensing techniques. Evaluate the cost-effect and relate to operation Corps needs. Develop algorithms for the use of remote sensing in coastal engineering. This will involve multi-sensor evaluation such as LANDSAT, SEASAT, HCMM, TIROS-N, NIMBUS-G, scanners, multi-spectral, laser and conventional aerial photography.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Coastal Engineering Research Center

5.0055, PREDICTION OF WAVE TRANSFORMATION IN SHALLOW WATER

L. Vincent, U.S. Dept. of Defense, Army, Corps of Engineers, Coastal Engineering Research Center, *Kingman Bldg., Fort Belvoir, Virginia* 22060 (31592)

OBJECTIVE(S): To determine the most satisfactory procedures for estimating wave conditions near shore from a knowledge of offshore waves for a variety of realistic conditions; to develop improved procedures for conditions in which available procedures are not adequate.

APPROACH: Aerial photographs and radar images will be used to determine actual refraction and diffraction patterns as waves move into shallow water. The results of refraction and diffraction calculations will be displayed as computer drawn maps of wave crests for comparison with the photographs and images mentioned above. Gage records of waves in deep and shallow water will be compared in this evaluation whenever practical.

Simultaneously with the above empirical study, the theory of energy propagation by gravity waves will be examined in a more fundamental way than that used in most operation theories of wave modification in the coastal zone. Theoretical analyses will be used in designing the empirical tests. Results of the empirical tests will be used in planning theoretical improvements for operational models.

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Coastal Engineering Research Center

5.0056, LANDSAT EVALUATION FOR AUTOMATED TERRAIN DATA EXTRACTION

R.D. Tynes, U.S. Dept. of Defense, Army, Corps of Engineers, MGI Data Div., *Fort Belvoir, Virginia* 22060 (DA0M8067)

To evaluate the image record characteristics of remote sensor systems such as LANDSAT, infrared, and radars to determine the image parameters and data content which can contribute to automated extraction of information required for topographic maps and MGI.

Through exploitation of the technical literature and other available data concerning systems imaging characteristics and applications, LANDSAT, radar and infrared systems will be analyzed for image record content and how it may contribute to automated terrain data extraction. Image processing and interpretation techniques will be identified along with computer processing software or algorithms. This work will utilize representative imagery collected under the work titled "Imagery Reference Set for Automated Terrain Data Extraction."

SUPPORTED BY U.S. Dept. of Defense, Corps of Engineers, Engineer Topographic Lab.

5.0057, X-RAY SPECTROSCOPY

H.J. Rose, U.S. Dept. of the Interior, Geological Survey, Geologic Division, *12201 Sunrise Valley Dr., MS 912, Reston, Virginia* 22092 (9770-00452)

X-ray spectroscopy, electron microprobe, and transmission and scanning electron microscopy are main areas of instrumentation. Major objectives are the development of methods and techniques for the bulk and micro-analysis of geologic specimens. An automated fully-focusing X-ray spectrometer has been built and is currently being tested for automatic trace element analysis as well as indicating a 10 to 20 fold increase in intensity for the elements F to Si.

Studies currently in progress include chemical and mineralogical characterization of polished coal mounts, peats and coal ashes, unconsolidated sediments from the Atlantic Coastal Plain, as well as the active support of other survey investigations requiring micro-mineralogical and chemical analysis. Participation in the Viking Mars program will continue with the preparation and analysis of Martian analog samples. Automated sample preparation techniques are also under study.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0058, STRUCTURAL ANALYSIS OF KENTUCKY
D.F. Black, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *12201 Sunrise Valley Dr., Reston, Virginia* 22092 (9510-01964)

STATE TO WHICH PROJECT PERTAINS: Kentucky.

As part of a summary of geologic findings that have resulted from the recently completed geologic mapping of the state of Kentucky, work is in progress to collect, analyze, and interrelate all available data bearing on the tectonic evolution of the region. The project is divided into three parts: (1) An analysis of fault-associated dolomitization of limestone formations in central Kentucky. (2) A comparative analysis made of geologic structural features defined by detailed mapping in northern, central, and southern Kentucky with other mapped, imaged, and subsurface sectional data compiled using geophysical, remote-sensing, and other geological techniques. (3) Preparation of a statewide map of structural features to be a companion to the general geologic map and geophysical maps also in preparation.

Part 1 is completed. Part 2 is about half completed. Part 3 is about one-third completed.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0059, FLUID INCLUSIONS IN MINERALS - NASA
E. Roedder, U.S. Dept. of the Interior, Geological Survey, Geologic Div., *12201 Sunrise Valley Dr., Reston, Virginia* 22092 (9710-01151)

Studies of the origin, mode of formation, composition, and significance of fluid inclusion (including silicate, sulfide, and gas phases) in lunar and meteoritic samples have yielded much data on the magnetic and geologic history of these samples and the processes they have undergone. Some of this information is not otherwise obtainable. Extrapolations to terrestrial sample analogs have been particularly fruitful.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Geologic Div.

5.0060, SATELLITE IMAGE ATLAS OF GLACIERS
R.S. Williams, U.S. Dept. of the Interior, Geological Survey, Land Information & Analysis Office, *12201 Sunrise Valley Dr., Mail Stop 710, Reston, Virginia* 22092 (E-0051)

STATES (AND FOREIGN COUNTRIES) TO WHICH PROJECT PERTAINS: Global project: Antarctica, Greenland, Iceland, Europe, Asia, Middle East, Africa, West Iran, New Zealand, South America, Mexico, Canada, United States (Colorado, Montana, Idaho, Oregon, Washington, Alaska, California, Utah, Nevada, Wyoming).

In FY 1979 it is planned to complete the identification and selection of the best LANDSAT and other satellite imagery over those areas of the world that have extant glaciers. The imagery will be sent to the various cooperating scientists of many domestic and foreign organizations from the U.S., Canada, USSR, PRC, United Kingdom, Chile, Argentina, France, Switzerland, Austria, Turkey, India, Japan, New Zealand, Iceland, Denmark, and Norway who will be authoring the geographic and topical chapters. The authors will complete the text of their chapters during the following 6-9 months and return it to the editors for the initial editing and cartographic work in preparation for publication as a U.S. Geological Survey Professional Paper. By the end of FY 1979 most, if not all, of the text and rough graphics should be in the editing process.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Land Information & Analysis Office

5.0061, WATER RESOURCES DIVISION SATELLITE DATA RELAY PROJECT
W.G. Shope, U.S. Dept. of the Interior, Geological Survey, Water Resources Div., *12201 Sunrise Valley Dr., Reston, Virginia* 22092 (WD 70-111)

There is a rapidly developing satellite data transmission technology that may provide the Water Resources Division with an economical means for collecting and disseminating in real-time data from remote sampling sites. Tests of the NASA LANDSAT and NOAH/NESS GOES data collection system have demonstrated the feasibility of mating USGS field instruments with field radios and routinely relaying the data. Yet to be determined are final specifications for an operational system, cost, benefits, and the feasibility of using a commercial service.

The objectives are to test and evaluate the performance characteristics of LANDSAT, GOES, COMSAT General, and subsequently available satellite data systems as potential operational tools. The results of these tests will be used to design and implement an operational satellite data telemetry system to support the collection of hydrologic data.

A number of LANDSAT DCS experiments have been conducted and will continue. The GOES-DCS was tested in 1976-77 and will continue to be tested through 1978. The COMSAT General 11 site demonstrations end June 19, 1978. A follow-up on COMSAT General pilot project involving 101 sites is expected to be tested in early 1979. This project will have overall responsibility for the program of testing these systems. The program will consist of technical coordination and direction from the project leader in Reston. Computer software support is being developed in the WRD Automatic Data Section.

LANDSAT and GOES are operational. The number of LANDSAT DCPs has decreased to 30. The GOES DCPs are slowly increasing and now stand at 110. The COMSAT General 11 site demonstration has been successfully completed. The computer software development has been progressing with the assistance of contractor support.

LANDSAT and GOES DCS activities will continue to receive support from this project. WRD will be continuing to support changes in the GOES system so that DCP problems can be detected automatically and data can be sent directly from NESS to the USGS MULTICS computer in Reston. Plans are also being considered to test a hydrologic data service from a commercial source.

SUPPORTED BY U.S. Dept. of the Interior, Geological Survey, Water Resources Div.

5.0062, DEVELOP MICRO AND MACRO TEXTURE MEASURES FOR LANDSAT SCENES
R.M. Havalick, Virginia Polytechnic Inst. & State University, Graduate School, *Blacksburg, Virginia* 24061 (NAS 5-25839)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

5.0063, STUDIES OF THE ATMOSPHERE USING AEROSPACE PROBES
V.E. Suomi, University of Wisconsin, Madison Campus, School of Letters & Science, Dept. of Meteorology, *500 Lincoln Dr., Madison, Wisconsin* 53706 (8-012; 04-6-158-44087 MOD. #5)

TECHNICAL OBJECTIVES: Investigate empirically and theoretically the use of satellite data, principally images from geostationary satellites, but augmented with polar orbiting data and conventional data in active areas -- as a means of attaining a more continuous picture both spatially and temporally of the evolution of severe weather systems.

APPROACH: Archive rapid scan GOES images with conventional data, which in turn will expand the data base from which observational studies of severe weather can be made. Examine cloud motion winds from these and other GOES sequences in particular cases to determine the advantages of using rapid scan imagery in identifying critical dynamical features associated with severe weather. Combine these case studies with theoretical studies to provide a fertile dynamical basis for the diagnosis, integration, and prediction of subsynoptic scale flow features influencing clouds, winds, and associated severe weather over a 12 hour period.

PROGRESS: Archiving of all data for all rapid scan cases in the past year has been achieved both on tape and in hard copy. Some case studies were initiated where it was found that many of the overshooting convective towers were colder than the surrounding anvils and were associated with severe weather events at the ground. Some projects nearing completion are: 1) generation mechanisms and the theory of inertial instability, 2) subsynoptic surface fields over the mountainous western states,

3) theory of steady state downstream adjustment, and 4) modeling the adjustment of mass and velocity fields near a strong jet.

SUPPORTED BY U.S. Dept. of Commerce, National Environmental Satellite Service, *Meteorological Satellite Lab.*

5.0064, SYNOPTIC-DYNAMIC APPLICATIONS OF METEOROLOGICAL SATELLITE DATA

L.H. Horn, University of Wisconsin, Milwaukee Campus, School of Letters & Science, Dept. of Meteorology, *Pearse Hall, Room 107, Milwaukee, Wisconsin* 53201 (8-612; NA79AA-H-00011)

TECHNICAL OBJECTIVES: a) Evaluation of satellite data, especially temperature profiles, with emphasis on their application to weather prediction. b) Development of techniques to maximize usefulness of data in forecast related problems, especially in the short term for the field forecaster.

APPROACH: a) Evaluation of TIROS-N vertical temperature/moisture soundings over the U.S. by synoptic case study utilizing satellite and coincident rawinsonde data independently and in combination. b) Combination of satellite soundings and satellite wind vectors to the advantage of both using balance relationships to establish dynamic consistency. c) Monitor propagating jet streams with 4/day soundings and relate movement to severe weather outbreak. d) Monitor cyclogenesis with emphasis on determining early indications of the onset of major weather changes.

SUPPORTED BY U.S. Dept. of Commerce, National Environmental Satellite Service, *Meteorological Satellite Lab.*

LIFE SCIENCES

Includes Life Sciences (general); Aerospace Medicine; Behavioral Sciences; Man/system Technology and Life Support; and Planetary Biology.

6.0001, DIRECT FIELD RESEARCH SUPPORT TO IMMEDIATE ARMY AEROMEDICAL PROBLEMS (02)

J. Treanor, U.S. Dept. of Defense, Army, Medical Research & Development Command, Bioengineering & Life Support Equipment Div., *Fort Rucker, Ozark, Alabama* 36362 (DA0D6734)

Provide US Army Aviation with sound and timely bioengineering information to solve operational problems generated in the interface of the physical and life sciences.

The techniques employed will vary, depending on the problem area, but will be based on sound accepted experimental methodology designed to provide the required information as expeditiously as possible.

SUPPORTED BY U.S. Dept. of Defense, Medical Research & Development Command, Aeromedical Research Lab.

6.0002, AUDITORY AND VISUAL INFORMATION PROCESSING

S.R. Parkinson, Arizona State University, School of Liberal Arts, Dept. of Psychology, *Tempe, Arizona* 85281 (DF223170; F33615-77-C-0053)

To investigate the information processing involved in instrument cross-check skills and task load stress.

An analysis of differences in visual scanning strategies employed by students and instructor pilots will be conducted. Visual scanning will be evaluated by both classical behavioral measures and film records of eye focus points. Task load problems will also be investigated. This research will be conducted in four phases: (1) The first phase will evaluate the effects of different amounts of exposure (using visual scanning tasks) on instrument displays measuring cross-checking capability. This phase should determine the amount of exposure which will result in maximum improvement in performance. (2) The second phase will examine critical features of instrument displays to see if presenting to trainees a variety of instrument displays early in training will facilitate more efficient critical feature analysis. The SS will also be presented with novel aircraft displays to determine if this training procedure will enhance ability to learn efficient scanning strategies. (3) the third phase will employ a central light display with dynamic scanning requirements similar to those of the flight task. Response latency measures will be taken on both pilots and non-pilots to compare differences in use of the information obtained from the central light display. Response latencies for IPS and trainees on cued trails will also be compared.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0003, AIR FORCE SKILLS MAINTENANCE AND REACQUISITION TRAINING RESEARCH PROGRAM PHASE I - PRELIMINARY EVALUATION

E.E. Eddowes, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF223960)

Develop and validate comprehensive, quantitative, objective procedures which will permit the Air Force to manage an individualized flying training program which will provide acceptable mission readiness at minimum cost. This work unit will document the planning and management of the Air Force Skills Maintenance and Reacquisition Training Research Program (Project SMART).

The objective of this research will be achieved through the sequential accomplishment of the following four phases: 1. Preliminary evaluation of Project SMART methodology. 2. Identify and define critical flying skills and develop and validate objective procedures for measuring them. 3. Measure the retention of mission readiness skills as a function of the duration of non-flying period. 4. Evaluate the effectiveness of alternative flying training programs designed to maintain or foster rapid reacquisition of mission readiness skills.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0004, A-10 TRAINING RESEARCH SUPPORT

S.T. Hannan, U.S. Dept. of Defense, Air Force, Human Resources Lab., *Williams Air Force Base, Chandler, Arizona* 85224 (DF223450)

To modify Cockpit A of the Advanced Simulator for Pilot Training (ASPT) to an A-10 configuration to provide a tactial weapons delivery capability, heads up display, A-10 flight and weapon scoring in support of transition training research and air-to-surface research capabilities.

The necessary hardware modifications will be performed on-site under the ASPT maintenance contracts. The flight dynamics for the A-10 will be developed under a joint in-house/contractor effort. The A-10 project has been segmented into two phases. Phase I addresses the modifications required for transition training/research and should be completed in the first quarter of FY 78. Phase II will provide the capability for air-to-surface research and is scheduled to begin 1 Jan 78. Efforts in phase II will refine the ASPT handling characteristics to approximate the A-10 performance as closely as possible. This phase will continue for 12-14 months.

SUPPORTED BY U.S. Dept. of Defense, Air Force, Human Resources Lab.

6.0005, PSYCHOTROPIC DRUGS AND FLYING ABILITY

D.S. Janowsky, U.S. Veterans Admin., Dept. of Medicine & Surgery, Medical Center, *3350 La Jolla Village Blvd., San Diego, California* 92161 (571-50-3144; 664-002-F)

This project found that 10 marijuana intoxicated pilots showed marked deterioration in simulated flying ability following smoking 6 mg delta-9 THC. This effect lasted for 1 to 2 hours, was definitely gone by 6 hours, and was intensified by social doses of ethanol.

During the past year, the role of the cholinergic nervous system in mood and neuro-endocrine regulation has been explored in 20 psychiatric patients. Discoveries include: 1) intravenous physostigmine (1 mg/100 lb.) caused transient depression in 7 euthymic depressives, but not in 8 alcoholics, and 2) in 20 psychiatric patients, physostigmine increased serum prolactin, cortisol, and growth hormone levels and changes in prolactin correlated with physostigmine-induced mood changes. Thus,

physostigmine may have potential as an affective disorder psychodiagnostic agent; and cholinergic factors may influence the regulation of growth hormone, cortisol, and prolactin.

Project resources have been utilized to determine some of the interpersonal effects of marijuana and methylphenidate. Marijuana (delta-9 THC equals 6 mg), in contrast to placebo, was found, in 20 normal volunteers, to decrease the accurate perception of affect. Also, the ability of 20 psychotherapists to express interpersonal skills as rated by their normal volunteer patients was decreased. Intravenous methylphenidate (0.5 mg/kg) was found to increase patient perceptions of being highly regarded in 20 psychiatric patients. In these patients, both at baseline and after methylphenidate, increases or decreases in perceived warmth, empathy, genuineness, and regard in a psychotherapist-interviewer occurred depending on patient mood state and/or mood changes respectively. This study has clinical implications in terms of defining the role of mood state and drug-induced mood changes in influencing interpersonal perceptions, and may suggest a motivational basis for stimulant abuse.

SUPPORTED BY U.S. Veterans Admin., Dept. of Medicine & Surgery

6.0006, DEVELOPMENT AND EVALUATION OF AN ION-BEAM SPUTTER-VENTILATED VENTRICULAR CATHETER
E.L. Foltz, University of California, Irvine Campus, California College of Medicine, Dept. of Surgery, *Irvine, California* 92664 (NAS 3-21963)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

6.0007, BONE RESORPTION AND CALCIUM ABSORPTION IN RATS DURING SPACEFLIGHT
C. Cann, University of California, San Francisco Campus, Graduate School, *551 Parnassus Ave., San Francisco, California* 94122 (NAS 2-10350)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0008, COMPUTERIZED TOMOGRAPHIC DETERMINATION OF SPINAL BONE MINERAL CONTENT
H.K. Genant, University of California, San Francisco Campus, Graduate School, *551 Parnassus Ave., San Francisco, California* 94122 (NAS 9-15887)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

6.0009, COSMOS 1979 EXPERIMENT - BONE MODELING/REMODELING IN THE RAT MANDIBLE
R. Baron, Yale University, Graduate School, *206 Elm, New Haven, Connecticut* 06520 (NAS 2-10338)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0010, DEVELOPMENT OF A NEW NON-INVASIVE METHOD TO DETERMINE BONE INTEGRITY IN VIVO
J.A. Albright, Louisiana State University, Shreveport Campus, School of Medicine, Dept. of Orthopaedics, *Shreveport, Louisiana* 71105 (NAS 9-15950)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lyndon B. Johnson Space Center

6.0011, COSMOS 1979 EXPERIMENT - TRABECULAE AND MINERALIZATION IN THE LONG BONES
J.L. Matthews, Baylor College of Medicine, School of Medicine, *1200 Moursund Ave., Houston, Texas* 77025 (NAS 2-10354)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0012, GROWTH RATE AND HISTOLOGY OF LONG BONES AND VERTEBRAE
W.S. Jee, Utah Higher Education System, University of Utah, School of Medicine, Dept. of Anatomy, *1400 E. 2nd S., Salt Lake City, Utah* 84112 (NAS 2-10308)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

6.0013, DUAL PHOTON ABSORPTIOMETRY SYSTEM FOR GROUND-BASED MEASUREMENTS OF THE LUMBAR SPINE IN MAN
R. Mazess, University of Wisconsin, Madison Campus, Medical School, Dept. of Radiology, *307 N. Charles St., Madison, Wisconsin* 53706 (NAS 2-10359)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Ames Research Center

MATHEMATICAL AND COMPUTER SCIENCES

Includes Mathematical and Computer Sciences (general); Computer Operations and Hardware; Computer Programming and Software; Computer Systems; Cybernetics; Numerical Analysis; Statistics and Probability; Systems Analysis; and Theoretical Mathematics.

7.0001, SOFTWARE AND HARDWARE DESIGN FABRICATION TESTING AND DOCUMENTATION OF MICRO COMMUNICATION SYSTEM
J.L. McIver, Colorado State University, Graduate School, *Fort Collins, Colorado* 80523 (NAS 5-25760)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

7.0002, A STUDY IN MATHEMATICAL PHYSICS
F. John, New York University, Washington Square & University College of Arts & Sciences, Dept. of Mathematics, *421 1st Ave., New York, New York* 10012 (MCS76-07521 A02)

This is a continuation of research previously supported under MCS73-08466AO2.

F. John will work on the study of singularities occurring in the motion or equilibrium of elastic bodies. Three different effects contributing to singularity formation can be recognized: focussing, shock formation and change in type; each of these three effects is relevant to certain situations in elastic media. F. John will continue the analysis of their development.

D. Ebin will continue his work on applications of modern analysis to fluid dynamics. He has worked on flow, satisfying the Euler equations, and more recently on the relation between compressibility and incompressibility in particular, on the asymptotic approach to incompressibility if the coefficient of compressibility tends to zero. This is a degenerate behavior since in the resulting equations there is pressure but it has no longer any connection to density.

G. Kriegsmann will investigate numerical solutions of the reduced wave equation with a variable index of refraction, including negative indices, and will apply geometric optics to problems connected with inner and outer expansions for complicated diffraction problems.

SUPPORTED BY U.S. National Science Foundation, Div. of Mathematical & Computer Sciences

PHYSICS

Includes Physics (general); Acoustics; Atomic and Molecular Physics; Nuclear and High-energy Physics; Optics; Plasma Physics; Solid-state Physics; Thermodynamics and Statistical Physics. For Related Information See Also Engineering.

8.0001, COMPILATION OF ATOMIC ENERGY LEVEL AND GROTRIAN DIAGRAMS FOR ALL STAGES OF IONIZATION FOR ALL ELEMENTS
S. Bashkin, University of Arizona, School of Liberal Arts, Dept. of Physics, *Tucson, Arizona* 85721 (PHY79-06546)

Financial assistance will be provided to support the continuation of a compilation of atomic energy-level and Grotrian

diagrams. These diagrams will summarize present knowledge of the structure of each type of atom in each of its states of ionization.

This research is a continuation of that currently supported under NSF Grant PHY76-22667 A02.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0002, HIGH POWER SURFACE RESISTANCE AND CRITICAL MICROWAVE FIELDS OF TYPE I AND TYPE II SUPERCONDUCTORS FOR MICROWAVE RESONATORS

J.E. Mercereau, California Inst. of Technology, Graduate School, Dept. of Physics Mathematics & Astronomy, *1201 E. California Blvd., Pasadena, California* 91109 (PHY79-09773)

This is a continuation of work done under PHY76-81713 A05.

This work represents part of a program to design, test and construct a prototype of a superconducting LINAC to be used as a post-accelerator for the SUNY Stony Brook Tandem Van de Graaf. The work to be supported under this grant will be the continued preparation and testing of superconducting surfaces, mainly lead-plated copper, and the design and construction of a resonator with a large beta to be used in the second half of a LINAC post-accelerator when the ion velocities have increased.

This group will also be working on the demonstration of the feasibility of producing higher beta modules with the desired characteristics under industrial conditions. This work will be done under separately funded subcontract with the Stony Brook Group.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0003, MEASUREMENT OF ATOMIC TRANSITION PROBABILITIES

W. Whaling, California Inst. of Technology, Graduate School, Dept. of Physics, *1201 E. California Blvd., Pasadena, California* 91109 (AST7826033)

This project will be concerned with the measurement of atomic transition probabilities useful for the quantitative analysis of hot gases and plasmas. Transitions selected for study are those that are prominent in astrophysical spectra. For neutral and singly charged ions, the experimental procedure includes a comparison with solar equivalent widths to test the internal consistency of the measured transition probabilities.

During the grant period this project will (1) continue measurements in progress on the resonance lines of doubly-ionized iron (Fe III), (2) determine transition probabilities in cobalt, and (3) explore the use of the one meter Fourier Transform Spectrometer at the Kitt Peak National Observatory as a tool for measuring transition probabilities.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

8.0004, NEW SUPERCONDUCTING MATERIALS PRODUCED BY SPUTTERING

A.C. Lawson, Claremont Colleges, Pomona College, Undergraduate School, Dept. of Physics, *Claremont, California* 91711 (PRM79-13192)

Superconductivity above 15K is found in only distinct crystal structures: the beta-tungsten structure, the defect NaCl structure, the Chevrel phase structure, and the Pu2C3 structure. It is finally possible to synthesize Nb3Ge with a transition temperature in excess of 23K with the use of sputtering, a technique which has proved its usefulness only with the elapse of twenty years after the initial discovery of superconductivity in the beta-tungsten structure. We now propose to investigate the superconductivity of (Th,Y)2C3 materials produced by sputtering. The dependence of the superconducting properties on sputtering conditions will be determined. The synthesis of the unstable cubic Laves phases will also be investigated for the purpose of determining the extent to which sputtering can be applied to the problem of metallurgical instability.

The NSF award provides essential equipment for this research, including a wafering machine, vacuum pumps, a residual gas analyzer, and other items.

SUPPORTED BY U.S. National Science Foundation, Office of Planning & Resources Management

8.0005, ELECTRON SCATTERING BY LASER EXCITED ATOMS

S. Trajmar, U.S. National Aeronautics & Space Admin., Jet Propulsion Lab., *4800 Oak Grove Dr., Pasadena, California* 91103 (PHY79-05971)

This project in atomic physics will study the scattering of electrons by atoms excited to specific states by a laser. A tunable dye laser will be used to populate individual hyperfine levels of specific isotopes and to prepare the target with known alignment and orientation (magnetic sublevel populations). Collision of nearly monoenergetic electrons with these excited species will be studied and the laboratory measurements will yield scattering amplitudes and relative phases as well as cross-sections for the various collision processes.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0006, SCALING BEHAVIOR NEAR VALENCE INSTABILITIES

J.M. Lawrence, University of California, Irvine Campus, School of Physical Sciences, Dept. of Physics, *Irvine, California* 92664 (DRM79-06578)

Thermodynamic experiments such as susceptibility, electrical resistivity, and thermal expansion will be carried out to examine the scaling behavior of the effective moment in certain mixed valence materials. A Cerium-Tin-Indium alloy, a periodic mixed valence system, has given indications that some features of single impurity scaling theory are valid. Experiments in other cerium intermetallics will be carried-out to test the general validity of the scaling results. These experiments will be done on systems in which the valence can be altered smoothly by alloying, from trivalence to intermediate valence to tetrovalence.

This research was previously supported under DMR 7682109.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0007, THEORETICAL INVESTIGATIONS OF SURFACE EFFECTS IN SOLIDS AND THE PROPERTIES OF SEMICONDUCTORS

A.A. Maradudin, University of California, Irvine Campus, School of Physical Sciences, Dept. of Physics, *Irvine, California* 92664 (DMR7809430)

The purpose of this research program is to increase our understanding of surface physics and semiconductor physics. The study of surface physics will emphasize lattice dynamical properties. The results should be useful in understanding the phenomena of attenuation, second harmonic generation, and refraction of surface elastic waves. A first-principle quantum mechanical calculation will be made of the atomic force constants at a metal surface which should be useful in interpreting experiments on low-energy electron diffraction. Studies will also be made of the effect of spatial dispersion on surface plasmons which should be of interest in connection with electron energy-loss experiments. The investigations of semiconductor physics will include studies of impurity states and electronic Raman scattering in inversion of metal-oxide-semiconductor devices. The results should improve our understanding of these devices. Impurity states will also be studied in compensated semiconductors in magnetic fields. Excitations known as interface polaritons will be investigated for planar interfaces between two semiconductors differing in such properties as carrier concentration and polar character.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0008, LOW-TEMPERATURE ACOUSTICS
I. Rudnick, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Physics, *405 Hilgard Ave., Los Angeles, California* 90024 (DN523202; N00014-75-C-0246)

Cryogenic techniques and devices, including power generation, gyroscopes, and signal processors, have been proposed for the Navy of the future. It is the objective of this research to support those efforts by developing a comprehensive and fundamental theoretical and experimental description of the physics of liquid helium.

Means for generating and detecting the four or more types of sound which propagate in liquid helium are devised, and these sounds in turn are used as tools to probe the superfluid medium.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0009, ARTIFICIAL STIMULATION OF AURORAL PLASMAS
A.Y. Wong, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Physics, *405 Hilgard Ave., Los Angeles, California* 90024 (DN875505; N00014-78-C-0754)

The objectives are to develop a better understanding of the auroral phenomena that lead to disruption of naval communications through active experiments, and to investigate the possible generation of radio waves at VLF frequencies and below through modulation of the earth's field-aligned currents.

A high-frequency pulsed ionospheric heater is being planned to carry-out the active experiments. It will be located in the auroral zone beneath the region where the nearly vertical field-aligned currents flow through the ionosphere. Currently theoretical analyses of expected effects and preliminary design of experimental equipment are being performed.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0010, THERMODYNAMICS, METALLURGY AND PHASE STABILITY OF HIGH-TEMPERATURE SUPERCONDUCTORS
G.W. Webb, University of California, San Diego Campus, Graduate School, *P.O. Box 109, La Jolla, California* 92037 (DMR77-23774)

An investigation will be made of the properties of high transition temperature superconductors. The study will focus on thermodynamic stability and normal state electrical resistivity. The microscopic factors leading the very high values of room temperature resistivity in certain high transition temperature compounds will be investigated. Heat capacity measurements will be used as probes of the thermodynamic stability. The connection between unusual features of the resistivity and heat capacity will be experimentally explored in a number of superconducting compounds.

Research previously supported under DMR75-04019. This is the first year of a 3-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0011, STUDIES RELATED TO DROPLET BURNING AT ZERO G
F.A. Williams, University of California, San Diego Campus, School of Engineering, Dept. of Aerospace & Mechanical Engineering, *P.O. Box 109, La Jolla, California* 92037 (NSG 3296)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Lewis Research Center

8.0012, MEASUREMENT OF X-RAYS IN THE MESOSPHERE
J.R. Barcus, University of Denver, School of Arts & Sciences, Dept. of Physics & Astronomy, *2115 S. University Blvd., Denver, Colorado* 80210 (NAS 5-25862)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

8.0013, LOW-ENERGY INELASTIC ATOMIC AND MOLECULAR COLLISIONS 16515-P
E. Pollack, University of Connecticut, Storrs Campus, School of Liberal Arts & Sciences, Dept. of Physics, *Storrs, Connecticut* 06268 (DA0G9099; DAAG29-79-C-0125)

To study low-energy atom-atom, ion-atom, ion-diatomic molecule collisions to understand the dynamics of excitation processes, obtain selection rules and scaling laws for both outer and inner shell processes. Relevance - the research has long-range potential relevance to diverse fields including ion implantation and surface physics, laser plasma excitation mechanisms, and some aspects of atmospheric modeling.

Inelastic energy loss (conversion of projectile energy into internal electronic excitation), observation of emitted photons and electrons in delayed coincidence, measurement of absolute differential elastic and inelastic cross-sections, total optical and x-ray emission cross-sections, and measurement of polarization.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

8.0014, CROSS-SECTIONS AND EQUILIBRIUM FRACTIONS FOR D ION AND D2 ION IN COLLISION WITH METHYL VAPORS
T.J. Morgan, Wesleyan University, School of Liberal Arts & Sciences, Dept. of Physics, *Middletown, Connecticut* 06457 (EY-76-S-02-4022)

OBJECTIVE: Obtain atomic physics collision information needed for design of neutral injection into fusion devices.

BACKGROUND: Almost no information available on alkaline targets and on D2 ion collisions.

PLAN: Measure cross-sections for single and double electron capture and negative ion equilibrium fractions for 1 to 100 rev D ion and D2 ions in collisions with alkaline earths.

RESULTS: Cross-sections in Mg, Ba for D ion. Equilibrium fractions in Ba for D ion.

SUPPORTED BY U.S. Dept. of Energy, Div. of Magnetic Fusion Energy

8.0015, ELECTRONIC STRUCTURE, SEMICONDUCTORS, METALS
B.M. KLein, U.S. Dept. of Defense, Navy, Naval Research Lab., *4555 Overlook Ave. S.W., Washington, District of Columbia* 20375 (DN980103)

Self-consistent augmented-plane-wave band-structure calculations will be performed for the semiconductors Si, Ge, Sn, GaP, GaAs, GaSb, InP, InAs, InSb, ZnSe and CdTe. Densities of states will be calculated and used in computations of optical reflectivity spectra. Charge densities, charge transfer, and ionicity will be determined and chemical bonding will be investigated. Band effective masses will be determined and compared with experiment.

The basic tool for calculating the electronic structure is the augmented-plane-wave (APW) method. The output of these calculations, electronic energies and wave-functions, are used with the appropriate theory and computer codes to calculate the properties of interest.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0016, THIRD SOUND - A STUDY OF THE SUPERFLUID FILM
K.L. Telschow, Southern Illinois University, Carbondale Campus, School of Science, Dept. of Physics & Astronomy, *Carbondale, Illinois* 62901 (DMR78-16749)

A newly developed high resolution technique for measuring the phase velocity of third sound will be used to study the properties of static and flowing helium-4 films. This technique shows promise of being able to measure Doppler shifted phase velocities to one part per million. These studies will concentrate on films ranging from three to twenty atomic layers in thickness and will invovle both subcritical and critical flows. In the case of static films, efforts will emphasize measurements of the superfluid fraction as close as possible to the transition temperature. Measurements of the Doppler shifted third sound for flowing films provide the only method of direct measurement of the superflow velocity via knowledge of the superfluid fraction as a function of velocity. Dissipation in the flowing film will be measured with high resolution; the flow velocity will be directly recorded under both driven and persistent current conditions. Such measurements will be the first to record all phases of dissipation within a single geometry. If the envisioned one part per million resolution is achieved--current limit is eighty parts per million--one should be able to use the Doppler shift technique to observe singly quantized circulation states. These studies are important for our fundamental knowledge of quantum hydrodynamics.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0017, MAGNETIC ORDER IN ALLOYS

H. Claus, University of Illinois, Chicago Circle Campus, School of Liberal Arts & Sciences, Dept. of Physics, *601 S. Morgan St., Chicago, Illinois* 60680 (DMR76-22125)

Magnetization measurements will be performed to investigate the low-temperature magnetic order of selected transition metal alloys near the critical composition for the onset of ferromagnetism. Initially, to investigate the change-over from long-range ferromagnetic order to spin glass type ordering, the low field a.c. susceptibility will be determined both as function of composition and of the degree of atomic short-range order. Emphasis will be placed on how the atomic short-range order affects the magnetic ordering and on information about the kinetics of atomic short-range order and the metallurgical homogeneity of the samples used. Then, on selected samples, detailed magnetization measurements will be performed to determine the important characteristics of the different types of magnetic ordering. The purpose of this study is to gain a better understanding of the approach to magnetic order in random alloys.

This research previously supported under DMR 7622125.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0018, LUMINESCENCE AND LASER STUDIES ON III-V SEMICONDUCTORS

N. Holonyak, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Electrical Engineering, *207 Engineering Hall, Urbana, Illinois* 61801 (DMR79-09991)

This research on luminescence studies of III-V semiconductors will provide the fundamental underpinning for the development of electronic devices such as quantum-well lasers and light-emitting diodes. The classes of materials to be studied include aluminum gallium arsenide/gallium arsenide heterostructures prepared by vapor phase epitaxy and indium gallium phosphorous arsenide prepared by liquid phase epitaxy. Attempts will be made to develop finer microstructures (thin films) by these methods. The liquid phase epitaxy growth method will be improved to grow coupled quantum-well heterostructures. The chemical vapor deposition crystal growth will be done by researchers at Rockwell International.

Studies will include determining the conduction behavior along quantum-well channels and a determination of the effects of doping in the wells and in the confining layers. The recombination characteristics will be examined to determine the phonon properties of quantum-well devices and to assess how strong phonon coupling can be used to improve device performance.

This research is a continuation of that initiated under NSF Grant DMR76-81432. This is the first year of a two-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0019, RESONANCE IONIZATION SPECTROSCOPY OF ATOMS

M.H. Nayfeh, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Physics, *207 Engineering Hall, Urbana, Illinois* 61801

The structure and interatomic interactions of atoms can be investigated by the resonance ionization spectroscopy method (RIS) using pulsed dye lasers. The method allows the investigation of low abundancy systems such as helium excited states or positronium atoms. Moreover, the method is very useful in searches for rare events, such as atoms with free quarks embedded in their nuclei. The RIS process also provides a highly sensitive method for resolution of binary collisions, since optically thin samples are used where many-body collisions or dimer absorption are essentially eliminated. These high-density problems cause loss of sensitivity in the traditional absorption and fluorescence methods.

SUPPORTED BY University of Illinois

8.0020, INTERACTING FERMI SYSTEMS

A.W. Overhauser, Purdue University, School of Science, Dept. of Physics, *Executive Bldg., West Lafayette, Indiana* 47907 (DMR78-00545 A01)

Research formerly supported by DMR74-03464.

Theoretical research will be carried-out with the objective of a deeper understanding of electron-electron interactions in solids. Several types of phenomena will be investigated, such as one-electron energy spectra, collective phase transformations, collective excitations and dynamic scattering phenomena.

Also, some types of physical properties which have been found experimentally to exhibit anomalous behavior will be studied. These include the unusual magnetoresistance of sodium and potassium, the unexpected dependence with magnetic field of acoustic wave generation in aluminum and potassium and the thermal resistance of potassium at high magnetic fields.

First year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0021, CONDUCTION ELECTRONS AND MAGNETISM

R.E. Prange, University of Maryland, College Park Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *College Park, Maryland* 20742 (DMR79-08819)

Research previously supported by DMR7708602.

A comprehensive theory of the magnetism of itinerant electron materials, such as iron and nickel, has been developed. This theory will be further elaborated and extended to other classes of materials. The work relies on the idea that there is short-range magnetic order in these systems even when long-range order vanishes above the Curie temperature. A way has been found to take account of this order, and it has been shown that electronic properties in these materials are little affected by the large-scale magnetic disorder near and above the phase transition. In particular, short wavelength spin waves are predicted to exist well above the Curie temperature, as is found experimentally. The origin of the short-range order will be investigated, using numerical techniques and simplified expressions derived for the effective spin-spin interaction. Also, recent experiments which claim to measure electronic properties in nickel near the critical point will be analyzed. These confirm in a general way the prediction of small changes in these properties but have some puzzling features. Further the new ideas will be applied to weak ferromagnets, amorphous metallic ferromagnets and possibly spin glasses and antiferromagnets. Finally, various transport phenomena in magnetic metals will be examined to see if the un-

derstanding of the interaction of electrons with magnetic disorder aids in their elucidation.

This is the first year of a three year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0022, PURCHASE OF FOUR-WIRE CONDUCTANCE BRIDGE AND TEMPERATURE SENSOR

S.B. Crary, Amherst College, School of Liberal Arts, Dept. of Physics, *Box 65, Amherst, Massachusetts* 01002 (PRM79-19651)

A low-power, 4-wire conductance bridge incorporating a germanium sensor will be purchased for use in an investigation of the low temperature thermal properties of monolayer films of helium-3. Data will be obtained in the temperature range from 0.08 Kelvin to 4.2 Kelvin.

SUPPORTED BY U.S. National Science Foundation, Office of Planning & Resources Management

8.0023, ALL-SKY MONOCHROMATIC TV OBSERVATIONS OF AIRGLOW EMISSIONS FROM ARECIBO

R.H. Eather, Boston College, Chestnut Hill Campus, School of Arts & Sciences, Dept. of Physics, *140 Commonwealth, Chestnut Hill, Massachusetts* 02167 (ATM78-22601)

Over the past decade we have grown increasingly aware of the presence and importance of dynamics in the upper atmosphere. Separately, there has been a growing interest in electron concentration structure, as related to transport and instability and communication effects. This grant funds deployment of a state-of-the-art instrument that significantly extends our ability to make measurements improving our morphological and phenomenological understanding in both of these areas.

In the past, time continuous altitude profile (multi-parameter) measurements by incoherent scatter radars at the Arecibo Observatory have significantly expanded our knowledge of low latitude dynamics, transport, and structure in the thermosphere and ionosphere. However, such data are limited by time resolutions of order minutes, and special coverage of one line of sight nominally overhead. This grant funds deployment of an instrument that will measure airglow intensities at night, with a time resolution of seconds, and special coverage of an area exceeding 1000 km across. The instrument will monitor atmospheric emissions dependent upon electron and atmospheric concentrations in the mid thermosphere (6300A) and upon atmospheric concentration in the lower thermosphere (5577A). These 'overview' data and the Arecibo radar 'detailed' data will each be significantly more meaningful within the context of the other, in identifying and understanding a number of thermospheric dynamical effects.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Atmospheric Sciences

8.0024, NUCLEATION AND GROWTH OF SOLID-STATE TRANSFORMATIONS

M. Cohen, Massachusetts Inst. of Technology, School of Engineering, Dept. of Materials Science & Engineering, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DMR79-15196)

The mechanisms of nucleation and growth in martensitic transformations are being investigated theoretically and experimentally toward the ultimate objective of understanding and controlling the overall reaction kinetics as well as the morphology of the transformation product. There will be a progressive shift of emphasis in this work from the nucleation phenomena under previous and current study, to the structure of the generated interphase boundaries, and then to the propagation dynamics of such interfaces. The interface-velocity law will involve a generalized thermodynamic driving force for the non-isothermal, non-adiabatic conditions at play, the dislocation structure of the interphase boundary as determined by the crystallography of the lattice and lattice-invariant deformations, and the degree of elastic vs. plastic accomodation of the operative transformational shape change. The closely-coupled interactions among these processes are also likely to govern the fine structure of the transformation product and, hence, to play a guiding role in the manipulation of certain structure-property relationships.

This is a continuation of research previously supported under NSF Grant DMR76-22993-A02. This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0025, SUPERRADIANCE - NEW METHODS OF PRODUCTION AND DETAILED STUDIES OF NEW EFFECTS

M.S. Feld, Massachusetts Inst. of Technology, School of Science, Dept. of Physics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (PHY78-18120)

This research in atomic physics will study certain aspects of superradiance which is a fundamental effect involving the coherent spontaneous emission of light by a collection of atoms or molecules. The program will include the study of superradiance by two new methods: (1) creation of a fully inverted (pi) initial state by adiabatic inversion of an optically-thick sample and (2) preparation of an optically-thick system in a pi/2 configuration by suddenly terminating a resonant saturating field. The research will also study basic features of superradiant emission and explore theoretical predictions using these new techniques of producing superradiant radiation, as well as now standard optical pumping methods.

This is the first year of a two-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0026, INVESTIGATION OF TOPICS IN OPTICAL ELECTRONICS AND GENERATION OF FAR-IR RADIATION 16225-P

A. Javan, Massachusetts Inst. of Technology, School of Science, Dept. of Physics, *77 Massachusetts Ave., Cambridge, Massachusetts* 02139 (DA0G9032; DAAG29-79-C-0028)

(1) To study the fundamental physics of high speed metal-barrier-metal junctions and their application to optical electronics. (2) To search for novel approaches and perform experiments that will lead to generation of intense coherent radiation in the FIR and millimeter wave regions. Relevance - tunneling junctions are of fundamental importance to the detection and production of electromagnetic radiation. This directly impacts Army systems in the MW, FIR, and IR spectral regions. The fabriction techniques raise the possibility of the manufacture to sophisticated IR systems at low cost. The FIR generation work bears directly on the Army's NMMW thrust.

To deposit junctions of very small size and controlled barrier thickness in the visible, IR, FIR, MW, and RF spectral regions in order to observe their response as a function of applied bias. The ultimate goal is to extend microelectronic techniques into the optical spectral region. For the production of FIR radiation, they will consider rotational nonequilibrium, low-lying vibrational states, excitation by slow electrons and impurity levels in semi-conductors.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command, Army Research Office

8.0027, ATMOSPHERE EXPLORER, DYNAMICS EXPLORER, AND SAN MARCO DATA SOFTWARE DEVELOPMENT

G.R. Carignan, University of Michigan, Ann Arbor Campus, School of Engineering, Dept. of Electrical Engineering, *Ann Arbor, Michigan* 48104 (NAS 5-25916)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Goddard Space Flight Center

8.0028, QUANTUM DYNAMICS OF MOLECULAR INTERACTIONS

W.R. Gentry, University of Minnesota, Minneapolis Campus, School of Liberal Arts, Dept. of Physics & Astronomy, *322 Johnston Hall, Minneapolis, Minnesota* 55455 (CHE79-08346)

This research is in the area of quantum chemistry; it involves molecular beam scattering. Drs. Gentry and Giese intend to continue pulsed molecular beam measurements of differential cross-sections for state-resolved rotational transitions in atom-diatom and diatom-diatom collisions, and to extend this research to the study of vibrational-rotational energy transfer processes. Taking advantage of the unique capabilities offered by the combination of a pulsed molecular beam and a pulsed laser, they also plan to study bimolecular reactive collisions of excited molecules, and the dynamics of unimolecular fragmentation following vibrational or electronic excitation under collision-free conditions. This research represents a continuation of that currently supported by Foundation grant CHE7611368.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Chemistry

8.0029, SURVEILLANCE - DISSOCIATIVE CHARGE TRANSFER EXCITATION

J.J. Leventhal, University of Missouri, St. Louis Campus, School of Arts & Sciences, Dept. of Physics, *8001 Natural Bridge Rd., St. Louis, Missouri* 63121 (DN675483; N00014-76-C-0760)

Charge transfer processes occur in many gaseous lasers, in the ionosphere, and plasmas. Radiative charge transfer is an important means of producing population inversion in metal vapors. Thus, it is important to the naval areas of communications and surveillance to obtain a better understanding of the mechanisms involved in charge transfer excitation of metal vapors which have potential laser application.

The present apparatus is being modified so that VUV and soft x-rays can be observed. Then collisions of He (2 plus) with Li will be studied. It has been predicted theoretically that this should lead to a selective population of the He-plus (31) states. Collisions between other low Z ions and Li will also be studied if time permits.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0030, STUDY OF GEOLOGICAL MATERIALS BY THE METHODS OF PARTICLE TRACKS, THERMOLUMINESCENCE AND RARE GASES

R.M. Walker, Washington University, School of Arts & Sciences, Dept. of Physics, *4559 Scott Ave., St. Louis, Missouri* 63130 (EAR7822440)

This is a continuation of research supported under NSF grant EAR76-22697 and A01.

A continuing search for superheavy elements is proposed using low-level spontaneous fission counting experiments on plastic track detectors. The samples to be used in these experiments will be separated fractions of the Allende meteorite and hot springs extracts obtained from Russia. The anomalous fission events in these samples may indicate the presence of superheavy elements.

The discovery of large numbers of meteorites in Antarctica opens up an exciting new chapter in meteoritics. These meteorites give the first opportunity to look at the behavior of cosmic rays at discrete intervals of time in the past. Also these meteorites make it possible to determine if the nature of the meteorite flux hitting the earth has changed in time. The time factors in various age determinations will be measured using the radiation damage (fossil track technique in films) and measurements of radioisotopes such as 26Al and 53Mn, etc.

Thermoluminescence measurements will be made routinely as a method of measuring terrestrial ages and delineating those meteorites with unusual orbital elements.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Earth Sciences

8.0031, SUPERCONDUCTIVITY IN FILAMENTARY EUTECTIC COMPOSITES

M.P. Zaitlin, Dartmouth College, School of Arts & Sciences, Dept. of Physics & Astronomy, *P.O. Box 833, Hanover, New Hampshire* 03755 (ER-78-S-02-4938)

High quality filamentary eutectic composites of Nb-Th and Nb-Y have recently been developed by Prof. J.D. Verhoeven at the Ames Research Laboratory. These materials consist of very small (i.e. approximately 100A) diameter superconducting filaments embedded in a normal metal matrix. Measurements of the thermal and electrical conductivity of these materials will be made near the superconducting transition temperature to observe the effects of thermodynamic fluctuations. Josephson coupling between filaments is expected to play an important role in the superconducting properties of these materials. This coupling can be varied by changing the distance between filaments which can be done by drawing down the wire or using different normal metal matrix materials. If necessary, the normal metal may be etched away at several points along the wire to eliminate the coupling. The fluctuation conductivity will be studied as a function of filament spacing.

This coupling is also expected to produce a crossover from one-dimensional to three-dimensional superconductivity which could be detected in the electrical conductivity near Tc. Evidence for such a crossover has been observed in granular films but the relevant physical parameters are better characterized and easier to adjust in a filamentary eutectic.

SUPPORTED BY U.S. Dept. of Energy, Div. of Basic Energy Sciences

8.0032, HYPERFINE INTERACTIONS AND ELECTRONIC STRUCTURE BY MOSSBAUER/CONVERSION ELECTRON SPECTROSCOPY

N. Koller, Rutgers the State University of New Jersey, New Brunswick Campus, School of Arts & Sciences, Dept. of Physics, *Old Queens Bldg., New Brunswick, New Jersey* 08903 (DMR79-00816)

The microscopic origins of the hyperfine interactions at nuclei in magnetic environments will be investigated using a high transmission, high resolution electron spectrometer. This spectrometer will detect conversion electrons resulting from Mossbauer transitions in isotopes of iron and tin. These experiments make possible the direct measurement of the charge and spin density of the electrons at the nuclear site and provide a sensitive test of electronic wave function calculations. It will also be possible to measure the effect of the chemical environment in various materials. This research previously supported under DMR 7602053 AO2. This is the first of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0033, SPIN ALIGNED ELECTRONS IN SEMICONDUCTORS

R.R. Alfano, City University of New York, City College, School of Arts & Sciences, Dept. of Physics, *Convent Ave. & 138th St., New York, New York* 10031 (DMR7817805)

Picosecond time resolved spectroscopy will be used to study the dynamics of optically spin aligned electrons in semiconductors. The interactions among and between spin aligned electrons and plasmons will be investigated. The spin dephasing time will be measured as a function of temperature, photon energy of the exciting light pulse, and carried density of P-type and N-type semiconductors. The effect of intervalley and intravalley scattering processes on the spin alignment will be investigated by measuring the transient development of the distribution function of the photo-generated electrons and holes. The polarization kinetics of the "hot" photoluminescence spectrum will be studied to obtain information on the energy, momentum and spin-relaxation of the electrons in gallium arsenide and other III-V and II-IV semiconductors. This program will provide fundamental insight into the underlying mechanisms for the relaxation of optical spin aligned electrons in semiconductors.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0034, RESONANCE PHYSICS

S.R. Hartmann, Columbia University, School of Arts & Sciences, Dept. of Physics, *Broadway & W. 116th St., New York, New York* 10027 (DMR79-06382)

The spectroscopic and relaxation properties of rare earth ions in laser quality host materials, particularly lanthanum fluoride, will be studied by a variety of optical resonance techniques. Nuclear double resonance techniques involving either continuous-wave laser hole burning or stimulated photon echoes will be used to obtain hyperfine structure and associated linewidths. Photon echo experiments will be used to obtain relaxation behavior from thermal and concentration dependent sources and modulation behavior from interferences among hyperfine levels.

This research was previously supported by DMR 7705995 A01.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0035, THEORETICAL RESEARCH IN CONDENSED MATTER PHYSICS

V. Ambegaokar, Cornell University, Ithaca Campus, School of Arts & Sciences, Dept. of Physics, *Ithaca, New York* 14850 (DMR77-18329)

This research was previously supported under grant DMR-7423494.

Theoretical research will be carried-out on a wide range of topics in condensed matter theory. Among the problems which will be considered are: (1) Non-equilibrium effects in superconductors. (2) Chemical kinetics. (3) Superfluidity of liquid 3He. (4) Dense conducting fluids, especially their behavior near the liquid-vapor transition; (5) optical properties of metallic systems, including generalizations to electron energy loss phenomena. (6) Photoemission, including an attempt to understand the microscopic fields near surfaces and how they may bear on the interpretation of angle integrated and angle resolved photoemission. (7) Zero temperature freezing and melting of Bose and Fermi systems. (8) Exact simulations of bulk helium four in both solid and liquid phases. (9) Surface and bulk singularities in the A-phase of 3He, their topological necessity and their bearing on the stability of superflow. (10) Local moment/valence fluctuation systems. (11) Transport processes across a liquid 3He-solid interface. (12) Low-temperature properties of solid bcc 3He.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0036, COMBUSTION THEORY FOR CLOUDS OF POROUS SOLIDS AT REDUCED GRAVITATIONAL CONDITIONS

A.L. Berlad, State University of New York, Stony Brook Campus, School of Engineering & Applied Science, Dept. of Mechanical Engineering, *Stony Brook, New York* 11794 (NSG 3298)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Lewis Research Center

8.0037, GENERAL RELATIVITY

P.G. Bergmann, Syracuse University, School of Arts & Sciences, Dept. of Physics, *Hall of Languages, Syracuse, New York* 13210 (PHY79-08887)

Research in theoretical gravitational physics initiated under NSF grant PHY78-06721 will be continued. Among the topics to be investigated are: A. Classical Relativity Theory - 1. Uncertain relations between electric and magnetic components of the Riemann tensor; 2. the definitions of multipole structure in the non-linearized theory. B. Quantization and Alternative Theories - 1. Phase integral quantization as a preliminary approach to quantization of the gravitational field; 2. the canonical quantization of general relativity by realizing the constraints as non-Hermitian operators; 3. supergravity with and without Grassman elements; 4. deformed twistor spaces in which self-dual gauge fields or H-spaces have been encoded to understand their role in the quantization of these fields.

This is the first year of a two-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0038, MOSSBAUER SURFACE STUDIES

R.W. Hoffman, Case Western Reserve University, Graduate School, Dept. of Physics, *2040 Adelbert Rd., Cleveland, Ohio* 44106 (DMR79-09078)

Free surfaces of solids, particularly nickel, will be studied by in-situ Mossbauer Effect Emission Spectroscopy (MEES) combined with other surface analytical techniques. MEES is an extremely sensitive technique, requiring only 10 to the 14th power radioactive cobalt-57 atoms cm to the negative 2nd power to provide measurable values of conduction electron density, electric field gradients and hyperfine fields at the nucleus. Combining low-temperature cobalt-57 deposition with clean surfaces gives quantitative free surface information not obtainable by other techniques. The MEES technique will be used to measure the surface magnetization and surface anisotropy of ferromagnetic crystals, surface Debye tempratures, surface site identification, and charge transfer at free and overlayered surfaces. Results will allow distinction between the theories for surface magnetism and provide a well-chracterized basis for some steric systems.

This research previously supported by DMR 7710640.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0039, RADIATION-INDUCED VOIDS BY POSITRON ANNIHILATION

J.D. McGervey, Case Western Reserve University, Graduate School, Dept. of Physics, *2040 Adelbert Rd., Cleveland, Ohio* 44106 (DMR79-06726)

Radiation-induced voids and other defects in aluminum, aluminum alloys and other materials will be studied by measuring positron lifetimes and the angular correlation of positron annihilation radiation. Samples will be irradiated at the Oak Ridge National Laboratory Reactor, and the new National Center for Small-Angle Scattering Research will be used to test the samples and compare results with the positron results. Quenched samples will also be studied to further clarify the nature of the defects by comparing the annealing behavior in the various samples. This comparison will clarify the role of impurities in the formation of voids and other defects, because transmutation-produced silicon and helium are present in irradiated aluminum. Aluminum-silicon and aluminum-magnesium alloys will be investigated by performing direct equilibrium measurements of binding energies between vacancies and impurity atoms, using an improved technique to eliminate uncertainties in previous measurements.

Research previously supported by DMR 7407190 AO1.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0040, ION PHOTODISSOCIATION AND PHOTO-FRAGMENT SPECTROSCOPY

J.T. Moseley, Oregon State Higher Education System, University of Oregon, School of Arts & Sciences, Dept. of Physics, *Johnson Hall, Eugene, Oregon* 97403 (CHE79-18074)

This research is in the area of quantum chemistry. Various techniques of ion photofragment spectroscopy will be used to investigate the potential surfaces, structural properties, and dissociations of molecular ions. These techniques yield spectroscopic information on gas-phase ions, uniquely detailed measurements on the evolution of near-threshold dissociation, accurate potential curves for diatomic ions, and lifetimes of predissociat-

ed states. Measurements will be extended to polyatomic ions such as O3 ion, O3-, CO3-, CH3I ion, H2O ion, CH2 ion, and N2O ion and to shorter wavelengths, using newly developed lasers. New techniques of fast ion spectroscopy will also be developed and applied to these ions. The techniques to be used allow measurements to be made with nearly Doppler-free resolution and permit the energy and angular distributions of photofragment ions to be determined. In some cases, all relevant quantum numbers involved in the transition can be specified, leading to the possibility of very detailed comparison with theoretical calculations. Cooperative research with the French group at Orsay will involve the measurement of high resolution kinetic energy distributions and of branching ratios in predissociation, investigation of the superposition of states in dissociation, and analysis and interpretation of experimental measurements relating to these problems. This research represents a continuation of that currently supported at SRI International by Foundation grant CHE7700428.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Chemistry

8.0041, THEORY OF CRYSTAL GROWTH, ONE- AND TWO-DIMENSIONAL QUANTUM PHYSICS AND DEFECTS IN SOLIDS

S. Chui, Franklin Inst. of the State of Pennsylvania, *20th & Benjamin Franklin Pkwy., Philadelphia, Pennsylvania* 19103 (DMR79-18697)

Several projects in theoretical solid-state physics will be carried-out. (1) The theory of crystal growth will be studied, particularly the theory of the dynamics of crystal growth. (2) The theory of the renormalization group will be applied to the study of one-dimensional materials, especially the one-dimensional Hubbard model. The methods will also be extended to the two-dimensional Hubbard model. (3) Calculations will be carried-out demonstrating the applicability of renormalization group ideas to quantitatively calculate defect states in solids.

This is a continuation of research previously supported under DMR-7611338.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0042, MASS ANALYSIS OF NEUTRAL PARTICLES AND IONS RELEASED DURING ELECTRICAL BREAKDOWNS ON SPACECRAFT SURFACES

B.R. Kendall, Pennsylvania State University, University Park Campus, School of Science, Dept. of Physics, *211 Whitmore Lab., University Park, Pennsylvania* 16802 (NSG 3301)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Lewis Research Center

8.0043, INDUSTRY-UNIVERSITY COOPERATIVE RESEARCH ACTIVITY - FAST RESPONSE ELECTRON SPECTROSCOPY

E.W. Plummer, University of Pennsylvania, School of Arts & Sciences, Dept. of Physics, *34th & Spruce Sts., Philadelphia, Pennsylvania* 19104 (DMR79-06535)

A new electron energy analyzer system, whose time-response and data-acquisition rates are orders-of-magnitude larger than existing systems, will be designed and constructed. The improvement will be achieved by use of a 100-strip multichannel detector, with output stored for processing in a digital computer. The increased data-acquisition rate will be useful for experiments with intrinsically low signal, such as extended x-ray absorption fine structure (EXAFS) from atoms adsorbed on surfaces, and for experiments where fast time response is critical, such as surface measurements where processes occurring at lower temperatures may be studied before contamination occurs, or time-dependent rate studies. This project will be a collaborative effort between scientists at the University of Pennsylvania and the Xerox Webster Research Center.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0044, THEORETICAL STUDIES OF THE ELECTRONIC STRUCTURE OF SMALL METAL CLUSTERS

K.D. Jordan, University of Pittsburgh, Graduate School, *1028H Cathedral of Learning, Pittsburgh, Pennsylvania* 15213 (NSG 2407)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Ames Research Center

8.0045, ATOMIC COLLISIONS AND PLASMA PHYSICS 16723-P

M.A. Biondi, University of Pittsburgh, School of Arts & Sciences, Dept. of Physics & Astronomy, *4200 5th Ave., Pittsburgh, Pennsylvania* 15260 (DA0G9009; DAAG29-79-C-0043)

To study atomic collisions related to the upper atmosphere. Relevance - this research provides basic information for ballistic missile defense systems, and has the potential for contributing parameters for studies of laser propagation in the atmosphere.

Experimental investigations of ion-molecule reactions and electron-ion recombination under conditions, and for species, of interest to DNA.

SUPPORTED BY U.S. Dept. of Defense, Army Materiel Development & Readiness Command,
Army Research Office

8.0046, PICOSECOND SPECTROSCOPY APPLIED TO THE STUDY OF SEMICONDUCTOR INTERFACES

H.J. Gerritsen, Brown University, Graduate School, Dept. of Physics, *University Hall, Box 1883, Providence, Rhode Island 02912 (DMR79-09701)*

Picosecond optical techniques will be applied to the study of excess carrier recombination at semiconductor interfaces. Of specific interest are group III-V semiconductors with bare surfaces, insulated interfaces, and heterojunctions. The novel experimental technique is based on the excitation of a region near an interface in a semiconductor by absorption of an ultrashort light pulse followed by a real-time measurement of the subsequent decay by time delayed ultrashort probe pulses. Specific information about the character of interface states as traps and recombination centers for electrons and holes will be obtained. *This is the first year of a three-year continuing grant.*

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Materials Research

8.0047, HIGH RESOLUTION LASER SPECTROSCOPY

R.F. Curl, Rice University, School of Natural Sciences, Dept. of Chemistry, *6100 Main, Houston, Texas* 77001 (CHE78-26572)

This research is in the area of quantum chemistry. Drs. Curl and Tittel intend to continue a program of research in three areas of laser spectroscopy and in corresponding areas of laser development. The three areas are visible dye laser studies of reactive small molecules, microwave optical double resonance studies of Van der Waals molecules in a supersonic jet (near UV region using doubled CW dye lasers), and Zeeman modulated intracavity absorption near infrared studies of the X-H stretch (X equals N,O,C) of the small free radicals NH2, HO2, CH2, CH3, and CH using a color center laser. In the visible dye laser region the development of a new optical-optical double resonance technique for studying nuclear hyperfine structure employing two CW single mode dye lasers frequency stabilized with respect to each other is planned. The application of this technique and of saturation spectroscopy to sorting out part of the perturbation mixing of the ground state with the excited state in NH and laser spectroscopy studies of BH2, BS, CS ion, and HCO are planned. Observation of microwave frequency rotational transitions using microwave optical double resonance of the He-pyrimidine complexes formed by supersonic nozzle expansion is to be carried out. The absorption spectra of small free radicals will be studied using Zeeman modulation by formation of the radicals in a flowing gas system inside the laser cavity. Finally, it is planned to use color center lasers to study the X-H stretch of hydride free radicals such as NH2, HO2,

CH3, CH2, and CH. This research represents a continuation of that currently supported by Foundation grant CHE7606103.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Chemistry

8.0048, SPIN DEPENDENCE OF ION-ATOM COLLISIONS AND HYPERFINE STRUCTURE OF SIMPLE IONS BY REORIENTATION SPECTROSCOPY OF STORED IONS

H.A. Schuessler, Texas A & M University, College Station Campus, School of Science, Dept. of Physics, *College Station,* Texas 77843 (PHY79-09099)

This research project studies the details of ion-atom and ion-molecule reactions by suspending a number of ions in a specific orientation in an electromagnetic field for many minutes, and bombarding them with a similarly well-defined beam of atoms or molecules. The results show the effects of isolated quantum-mechanical effects, and can be compared directly with theory. *The study of simple systems,* such as collisions between noble gas ions, and polarized alkali atoms, is emphasized. Molecular alignment by the dynamics of photodissociation will be studied. *The spin dependent collisions are then used to measure* fundamental atomic properties by reorientation spectroscopy. The magnetic moments of the electron, bound in the simplest *atom, 4He ion (no hfs) and of the simplest molecule, H2 ion* and measured to test basic relativistic and radiative contributions to the atomic structure. Hyperfine structure splittings of H2 ion *and of its isopic variants will be investigated to test ab initio* molecular theories. Certain aspects of the experiments are relevant to plasma in controlled thermonuclear reactions. The *charge transfer reactions are possible mechanisms for lasers in* the far ultraviolet region. Reactions involving molecular hydrogen and molecular hydrogen ions are important processes in stellar atomospheres.

This research is a continuation of that previously supported under NSF grant PHY76-81827A01.

This is the first year of a three-year continuing grant.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

8.0049, STRUCTURE AND BONDING IN AMORPHOUS AND QUASI-AMORPHOUS SOLIDS

S.C. Moss, University of Houston, School of Natural Sciences & Mathematics, Dept. of Physics, *3801 Cullen Blvd., Houston,* Texas 77004 (E-578)

Work has been concentrated on the application of X-ray absorption spectroscopy to the attachment and association of alkali ions to various molecular constituents. In particular both EXAFS and near-edge spectroscopy have been performed on the potassium K edge to denote differences in bonding among the simple hydrated state, the crystalline state in salts and cryptates and the associated state in various complexes in solution. It has been shown (in collaboration with H. Huang of Rice University) that potassium is not 'free,' as in aqueous solutions, in frog blood cells. Work continues on an analysis of the extended edge fine structure (EXAFS) in many of these materials.

In another area of disordered solids, a careful measurement of the lattice parameters of pure Pb and a Pb-0.0918 percent Au sample shows that Au in both monomer and tetramer defect states produces lattice contraction with the tetramer somewhat remarkably having the larger effect per atom. The observed monomer contraction suggests that the majority site occupancy for Au is substitutional and that the rapid Au diffusion must therefore involve a substitutional-interstitial mechanism.

SUPPORTED BY Robert A. Welch Foundation

8.0050, STUDY OF GRAVITATIONAL THEORY AND GENERAL RELATIVITY

R.A. Matzner, University of Texas, Austin Campus, School of Natural Sciences, Dept. of Physics, *200 W. 21st St., Austin, Texas* 78712 (INT78-22553)

Physicists from the Center for Relativity at the University of Texas at Austin will be collaborating with counterparts at the Center for Nuclear Studies of the National Autonomous University of Mexico. These scientists will be working toward elaboration of mathematical models of general relativity in which solutions of the equations differ in some important details from the Einstein model. Favorable results would lead to important developments in our understanding of stellar phenomena and the cosmos.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Scientific Technological & Internat. Affairs, Div. of International Programs

8.0051, COOPERATIVE OBSERVATIONS OF OPTICAL EMISSIONS DUE TO ENERGETIC NEUTRAL ATOM PRECIPITATION (THE EQUATORIAL AURORA)

B.A. Kinsley, University of Texas, Dallas Campus, Graduate School, *Richardson, Texas* 75080 (INT79-03438)

Professor B.A. Tinsley of the University of Texas at Dallas and Dr. Y. Sahai and Dr. N. Teixeira of Brazil's Institute of Space Studies will study optical emissions from the equatorial upper atmosphere. Such emissions have been observed from satellites and Dr. Tinsley has performed theoretical analysis of the emission effect. Analysis of the relative intensities and time variations of the emissions from hydrogen, helium, oxygen and nitrogen will give information on the time variation of ionic composition and energy distributions of ions in the atmosphere's ring current. The observation site near Sao Jose dos Campos, Brazil is at the optimum latitude for observation of the energetic particle effects. Existing equipment will be modified and tested in the U.S. and then shipped to the Cachoeira Paulista site between Sao Paulo and Rio de Janerio.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Scientific Technological & Internat. Affairs, Div. of International Programs

8.0052, INSULATORS FOR PLUMBUM-STANNUM-TELLURIUM METAL-INSULATOR-SEMICONDUCTOR DEVICES

A. Sher, College of William & Mary, Williamsburg College, School of Arts & Sciences, Dept. of Physics, *Ewell Hall, Williamsburg, Virginia* 23185 (NSG 1653)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

8.0053, STORED ION SPECTROSCOPY FREQUENCY STANDARD

D.J. Larson, University of Virginia, School of Arts & Sciences, Dept. of Physics, *Garrett Hall, Charlottesville, Virginia* 22903 (DN775566; N00014-78-C-0772)

Stored ion spectroscopy may provide a means of improving and simplifying highly accurate timing devices. Accurate timing is of interest to the Navy through improved positioning and missile accuracy. It may also be of importance in the areas of rapid transmission of digital data and long base line interferometry.

The microwave spectrum of S(minus), i.e., the fine structure transitions, is now being studied. The apparatus is being redesigned so that the S(minus) is produced by dissociative detachment from a pulsed beam of OCS rather than from a background gas of OCS since the latter reacts with S(minus) to form S(2)(minus). The photodetachment of S(2)(minus) is also being studied.

SUPPORTED BY U.S. Dept. of Defense, Navy, Office of Naval Research

8.0054, MEDIUM-ENERGY NUCLEAR PHYSICS STUDIES

C.E. Stronach, Virginia State College, Graduate School, Dept. of Physics, *Petersburg, Virginia* 23806 (NSG 1646)

SUPPORTED BY U.S. National Aeronautics & Space Admin., Langley Research Center

8.0055, GRAVITY, QUANTIZED FIELDS, AND RELATIVISTIC ASTROPHYSICS

L. Parker, University of Wisconsin, Milwaukee Campus, School of Letters & Science, Dept. of Physics, *Pearse Hall, Room 107, Milwaukee, Wisconsin* 53201 (PHY77-07111)

Research initiated under NSF Grant PHY72-05161 A02 will be continued. In addition to the areas of research under the previous grant, new topics in relativistic astrophysics will be investigated. John Friedman, who has recently joined the university as an Assistant Professor, is included in the present project as co-investigator.

Research under way on vacuum polarization and particle creation by strong gravitational fields will continue. Work on the quantum treatment of the damping of expansion anisotrophy in the early universe will be generalized and extended. A new type of infrared divergence occurring for quantized gravitational and scalar fields will be investigated. Other topics in quantum field theory on curved backgrounds will also be studied.

Research on the analogue for curved space-time of the Dirac charge quantization condition will be continued. A related area of research involves quantizing test electromagnetic fields on curved space-times with non-trivial topologies. The possible existence of spinor fields acted on by the group of diffeomorphisms on a space-time will also be investigated.

In recent work, John Friedman showed that all rotating Newtonian stars are unstable or marginally unstable to gravitational radiation; a key aim of his current research is to establish analogous results in general relativity.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Mathematical & Physical Sciences, Div. of Physics

SPACE SCIENCES

Includes Space Sciences (general); Astronomy; Astrophysics; Lunar and Planetary Exploration; Solar Physics; and Space Radiation. For Related Information See Also Geosciences.

10.0001, SUPPORT FOR ASTRONOMICAL RESEARCH AT STEWARD OBSERVATORY OF THE UNIVERSITY OF ARIZONA

P.A. Strittmatter, University of Arizona, Steward Observatory, *Tucson, Arizona* 85721 (AST78-25539)

Support will be provided for personnel to maintain, improve and operate equipment necessary for the scientific programs at the Steward Observatory of the University of Arizona. The growing complexity and sophistication of modern astronomical instrumentation has placed increasing demands on observatory personnel. Such personnel are required for operation of the telescope and for data acquisition and reduction. The main observational facilities of the Steward Observatory are the 90-inch, 36-inch, and 20-inch telescopes. The 90-inch is a general purpose telescope equipped with a wide range of instruments; the 36-inch telescope has been committed to a near-infrared sky survey. Instrumentation on the 90-inch telescope includes a Boller and Chivens spectrograph, a cassegrain echelle spectrograph, and a Fourier transform spectrometer.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0002, PIONEER VENUS PROBE ANOMALIES IN LOWER VENUS ATMOSPHERE

J.K. Goodman, California State University & Colleges, San Jose State University, School of Science, Dept. of Meteorology, *Washington Sq., San Jose, California* 95192 (NCA 2-675908)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Ames Research Center

10.0003, DIGITAL DESIGN AND PARTS DOCUMENTATION FOR SOLAR FLARE X-RAY DETECTOR

D.A. Anderson, University of California, Berkeley Campus, Graduate School, *2200 University Ave., Berkeley, California* 94720 (NAS 5-25876)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Goddard Space Flight Center

10.0004, SOLAR X-RAY FLARE EXPERIMENT FOR THE INTERNATIONAL SOLAR POLAR MISSION

D.A. Anderson, University of California, Berkeley Campus, Graduate School, *2200 University Ave., Berkeley, California* 94720 (NAS 5-25892)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Goddard Space Flight Center

10.0005, PHYSICAL CONDITIONS IN WARM MOLECULAR CLOUDS

J.I. Silk, University of California, Berkeley Campus, School of Letters & Science, Dept. of Astronomy, *Berkeley, California* 94720 (NCA 2-50904)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
Ames Research Center

10.0006, THEORETICAL STUDIES OF THE INTERSTELLAR MEDIUM

M.A. Jura, University of California, Los Angeles Campus, School of Letters & Science, Dept. of Astronomy, *405 Hilgard Ave., Los Angeles, California* 90024 (AST78-22676)

Theoretical investigations of physical processes in the interestellar medium will be carried out. Specific goals of this program are: (1) an elucidation of the formation mechanism of interstellar CH ion; (2) an improved determination of the ultraviolet albedo and phase function of interstellar grains; (3) a construction of models for scattering by dust grains to explain the observed optical polarization in external spiral galaxies. Achievment of these goals would substantially advance our knowledge of the interstellar medium and therefore lead to a better understanding of star formation and the evolution of galaxies.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0007, STELLAR PROPER MOTIONS AND PARALLAXES

A.R. Klemola, University of California, Santa Cruz Campus, Lick Observatory, Dept. of Astronomy & Astrophysics, *Mount Hamilton, California* 95140 (AST79-09098)

Astrometry is the field of astronomy concerned with the measurements of position and motions of celestial objects. This work is fundamental to all branches of astronomy, although perhaps not the most glamorous, particularly since it is necessary to pursue the measurements over long time base-lines. This project utilizes the distant galaxies as the fundamental reference system, thus providing a true inertial system. The first epoch photographic plates were obtained in the period 1947 through 1954. This project will obtain the second epoch plates. Since 1971, the start of this project, about 70 percent of the 1246 fields observable from Mt. Hamilton, California have been obtained and half of these measured. The phase of the project represented by this grant will continue this work. The specific goals of the analyses to be carried-out are: 1. Study of the general galactic rotation and possible deviations from a smooth pattern; 2. Study of the solar motion with respect to the nearby stars and determination of local systematic corrections to the fundamental system of coordinates as defined by the basic modern catalog AGK3 for the northern sky. Other projects which may be done include the measurement of distances of selected nearby stars and the positions and motions of objects of high immediate interest, such as comets, minor planets, and selected stars.

Prior support was by NSF AST 78-14276.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0008, EXPERIMENTAL TEST FOR VIOLATIONS OF THE EQUIVALENCE PRINCIPLE BY WEAK INTERACTIONS

P.D. Parker, Yale University, Graduate School, Dept. of Physics, *206 Elm, New Haven, Connecticut* 06520 (NAS 8-33572)

SUPPORTED BY U.S. National Aeronautics & Space Admin.,
George C. Marshall Space Flight Center

10.0009, STELLAR PARALLAXES AND PROPER MOTION

W.F. VanAltena, Yale University, Graduate School, Dept. of Astronomy, *206 Elm, New Haven, Connecticut* 06520 (AST76-81339 A02)

A program of astrometric research, with increasing emphasis on southern hemisphere coverage, will be continued. The determination of stellar parallaxes and proper motions by astrometric methods furnishes basic data important to other areas of astronomy. A star's distance from parallax measures permits finding the true brightness of the star and its position in space. The motions, from a comparison of stellar positions made with an interval of several years between observations, help to determine the sun's path among the stars and its position within our galaxy. The yardstick for all cosmic distances ultimately depends on these astrometric researches.

Over the next years the Yale investigators will work to reduce the deficiency of astrometric observations in the southern skies. Completion of the Yale Southern Proper Motion Program first epoch observations in Argentina, and an extension of the overlap with the Lick Observatory Northern Program, will be given top priority. Stellar parallax determinations, in part from early Yale observations in South Africa, will be continued. Membership determinations in southern star clusters from proper motion studies will be undertaken with the Yale astrometric telescope at Cerro Tololo Inter-American Observatory in Chile. A continuing effort will be made towards improving astrometric instrumentation and deriving all relevant positional information from photographic images to better utilize existing and future plate material.

Prior support was by NSF grant AST76-81339 A01.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0010, RESEARCH WITH A PHOTON-COUNTING IMAGE INTENSIFIER SPECTROMETER AT THE LAS CAMPANAS OBSERVATORY

L. Searle, Carnegie Inst. of Washington, *1530 P St. N.W., Washington, District of Columbia* 20005 (AST76-20839 A02)

The 2.5 meter DuPont telescope at the Las Campanas Observatory has now gone into operation. It will be equipped with a large Cassegrain spectrograph, a television system for acquisition of faint objects, and a photon-counting image intensifier detector system. This system will be upgraded to the point where it may be used routinely for observational programs by all staff members.

The first program to be done is an investigation of the stellar content of star clusters in the Magellanic clouds in order to determine the distribution of the age and chemical composition of these subsystems and to assess their significance to the chemical and dynamical evolution of galaxies. The second program is a radial velocity survey of galaxies brighter than sixteenth magnitude in the Zwicky catalog in order to investigate the structure of galaxy clustering in velocity space and to map the extent of the perturbation of the velocity field around rich clusters of galaxies.

This is a supplement to work previously supported under NSF grant AST 76-20839A01.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0011, RESEARCH ON SOLAR CORONAL ACTIVITY

M.K. McCabe, University of Hawaii System, Manoa Campus, Inst. for Astronomy, *2840 Kolowala St., Honolulu, Hawaii* 96822 (ATM76-10323 A02)

This grant will continue support of research on solar coronal activity at the University of Hawaii. This support has permitted the development of a technique for deriving whole sun infrared maps in the spectral line Me I 10830 that show coronal holes clearly. With this technique it is possible to obtain detailed time-series observations of structure, velocity and brightness fluctuations in the photosphere and chromosphere underlying holes, quiet regions and active regions.

The research objective of this grant is to use the 10830 maps to study the morphology and evolution of holes and other large-scale solar features. A further objective is to make a detailed study of the fine structure, velocity and brightness fluctuations, and the systematic velocity fields underlying holes, quiet regions and active regions at the photospheric and chromospheric levels. A major aim of this work is to understand the deposition of wave energy and momentum in coronal holes as contrasted with quiet and active regions. These observations will be used to develop improved methods for detecting holes using ground-based chromospheric observations.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Atmospheric Sciences

10.0012, AN EQUIPMENT PURCHASE FOR THE MIDWESTERN ASTRONOMICAL DATA REDUCTION AND ANALYSIS FACILITY

C.M. Anderson, Northwestern University, Evanston Campus, Graduate School, *633 Clark St., Evanston, Illinois* 60201 (AST79-00894)

This grant will provide funds for purchase of equipment for the reduction and analysis of astronomical data. Much of the data gathered at telescopes requires a great deal of sophisticated measuring and analysis apparatus. This equipment will be located on the campus of the University of Wisconsin and will be available for use by astronomers throughout the Midwest. The equipment to be purchased includes a P.D.S. microdensitometer, an interactive picture processor, tape and disk storage units, terminals and other input/output devices, and a minicomputer for the control of the entire system.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0013, DYNAMICAL INVESTIGATIONS OF GALACTIC STRUCTURE PROBLEMS

R.H. Miller, University of Chicago, School of Physical Sciences, Dept. of Astronomy, *5801 S. Ellis Ave., Chicago, Illinois* 60637 (AST76-14289)

A theoretical study to simulate by computer the processes that cause disk galaxies to take the shapes they do and how they can maintain those shapes as long as they must will be carried-out. Disk galaxies include barred and normal spirals, strongly flattened SO's, ellipticals, and ring galaxies. Numerical experimentation with simulated disk galaxies is the best way at present to investigate a variety of important problems in galactic dynamics. The physical stability of spiral galaxies is not understood. The velocity dispersions required for stable models are much greater than observed in our galaxy in the solar neighborhood. The problems of how our galaxy can be stable, or if it is stable, of how it can support a spiral pattern will be considered.

The computer simlations of the dynamics will be made into motion pictures to display the problems of galactic structure.

The motion pictures and other graphical displays will help both scientists and the public understand the problems.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0014, THEORY OF PULSAR ATMOSPHERES
E.A. Jackson, University of Illinois, Urbana Champaign Campus, School of Engineering, Dept. of Physics, *207 Engineering Hall, Urbana, Illinois* 61801

One of the exciting discoveries in astronomy during the past decade has been the existence of roughly 150 pulsars, which are stars which exhibit rapid, large-scale, periodic oscillations in their radiation. The pulsars are believed to be very dense (neutron) stars which have an intense magnetic field that rotates with the star. Associated with such a rotating field is a large electric field which can accelerate charged particles to high energies, producing the observed periodic radiation by a 'Lighthouse' effect. To confirm the neutron star hypothesis and explain the variety of observations, a theory is required for the plasma (ionized gas) atmosphere about such a star. This new type of stellar atmosphere, which is quite different than, for example, the sun's, can also occur in many other rotation magnetic stars which are not pulsars, and therefore may have much wider implications.

SUPPORTED BY University of Illinois

10.0015, VERY LONG BASELINE INTERFEROMETRY AT NORTH LIBERTY RADIO OBSERVATORY
R.L. Mutel, University of Iowa, School of Liberal Arts, Dept. of Physics & Astronomy, *Jessup Hall, Iowa City, Iowa* 52240 (AST79-10128)

A research program to conduct very long baseline interferometry (VLBI) experiments using the 18.3 meter radio telescope at the North Liberty Radio Observatory (NLRO) near Iowa City, Iowa, will be carried-out. The NLRO telescope constitutes one part of the VLBI Network, a national consortium of radio observatories conducting joint experiments at regular scheduled intervals. The Observatory's central geographic location and full-sky coverage ability make it an important addition to the Network by providing improved coverage of intermediate angular resolutions. Research projects at the University of Iowa which will benefit from the use of NLRO are the high resolution studies of hydroxyl masers surrounding stars and compact structure in extragalactic radio sources. The research on stellar OH masers will include VLBI maps of main radio spectral line emission from several supergiant stars, a determination of the relative position of the main line versus 1612 MHz spectral line masers in several objects, and a survey of compact structure in unidentified hydroxyl radical/infrared (OH/IR) astronomical objects. The continuum VLBI research includes mapping (using phase closure) the structure of several extragalactic radio sources, particularly the radio sources NRAO 150 and 30395. Monitoring the compact flux of a large number of variable sources at regular intervals will also be carried-out.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0016, THEORETICAL RESEARCH IN COSMOLOGY AND RELATIVITY
D.R. Brill, University of Maryland, College Park Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *College Park, Maryland* 20742 (PHY79-06940)

A number of problems in general relativity and cosmology will be pursued. These problems include (a) the connection between topology of extremal surfaces and physical properties in solutions of the Einstein equations, (b) mathematical and physical properties of constant curvature surfaces in asymptotically flat space-times, (c) the structure of solutions in the neighborhood of a linearization instability, and (d) applications of fiber-bundle techniques.

This is the first year of a three year continuing grant, previously supported under NSF grant PHY77-05299A01.

SUPPORTED BY U.S. National Science Foundation, Directorate for Mathematical & Physical Sciences, Div. of Physics

10.0017, OPERATION OF CLARK LAKE RADIO OBSERVATORY
W.C. Erickson, University of Maryland, College Park Campus, School of Arts & Sciences, Dept. of Physics & Astronomy, *College Park, Maryland* 20742 (AST79-08942)

Support is to cover a program of observations with the University of Maryland Teepee Tee Telescope at the Clark Lake Observatory in southern California and to complete the expansion of the present system into a multi-frequency radioheliograph. The radio spectra of quasars, supernova remnants, flare stars, and clusters of galaxies will be observed, along with compact and variable sources at decameter wavelengths, which will help to identify the energy generation and radio emission processes. Also planets and other objects of interest will be observed. Studies of the radio emission from the quiet and the active Sun are planned, with emphasis on coordination of investigations with the Solar Maximum Mission experiments. This will permit study of the nature and origin of coronal transients in collaboration with the White Light Coronagraph Experiment aboard SMM. Similarly, two-dimensional images of drifting bursts with time resolution of 10 milliseconds will assist in understanding the nature of hard x-ray spike bursts, their quasi-periodicity and the electron acceleration process. Images of type II and type IV sources associated with hard x-rays will be crucial in answering the question of origin of coronal hard x-rays, and in studying the physical processes involved.

Prior support was by NSF grant AST077-12282A02.

SUPPORTED BY U.S. National Science Foundation, Directorate for Astronomical Atmospheric Earth & Ocean Scis., Div. of Astronomical Sciences

10.0018, RADIATIVE TRANSFER - GRAVITATIONAL DYNAMICS
G. Rybicki, Smithsonian Institution, Astrophysical Observatory, strophysical Observatory, *60 Garden St., Cambridge, Massachusetts* 02138 (31T-4T50-05,06)

Work in radiative transfer theory has been in the area of resonance line transfer, transfer in multilevel atoms, spherical media and media with inhomogeneities. There has been particular involvement with basic methodology of these problems, especially in those adaptable to digital computation. Recent work on the newly discovered Q integral of the equation of transfer has been extended to another integral, called the P integral.

Collaborations with P. Noerdlinger on radiative transfer in rapidly expanding clouds (Astrophys. Journ., in press), have been completed as well as continuing joint efforts with P.G. Martin on radiative transfer through circumstellar dust shells. This latter work should aid understanding of the infrared spectrum of such objects.

In the field of gravitational dynamics Dr. Rybicki has worked on the statistical mechanics of gravitating systems and on methods of simulating galactic dynamics. He has completed experiments with Mr. G. Zimmermann on a new method of simulating solutions to the linearized Vlasov equation, the method of perturbation particles. Also, with Dr. Lecar and Miss M. Schaefer he has developed a method of relating surface mass densities of flattened systems, such as spiral galaxies, to the law of force in the plane of these systems. This method is also being applied to the inverse problem of finding surface mass densities from observed rotation curves of spiral galaxies.

SUPPORTED BY Smithsonian Institution, Astrophysical Observatory

10.0019, A SEARCH FOR SPHERICAL HALOS OF SPIRAL GALAXIES
D.J. Hegyi, University of Michigan, Ann Arbor Campus, School of Literature Science & the Arts, Dept. of Physics, *Ann Arbor, Michigan* 48104 (AST76-22109 A02)

A new photometric instrument, an annular scanning photometer (ASP), has recently been used to detect an optical halo surrounding the giant spiral galaxy NGC 4565. The halo is visible out to a distance of 34 kpc from the plane of the disk, a distance equal to 63 percent of the optical disk radius visible on the Palomar Sky Survey red prints. At this distance, the halo surface brightness was 1 part in 1,000 of the night sky in the spectral band of the instrument. Based on some preliminary V-I photometric data and the lack of other possible sources for the optical emission, it was concluded that the halo is composed of K7 or redder type stars and may be quite massive.

Observations will be extended to other galaxies and to obtain measurements out to greater radial distances. Most significantly, it will be attempted to determine the mass in halos. To do this, it will be necessary to conduct a major program in multicolor photometry. At this time the ASP is the most suitable instrument for this program.

This is a continuation of research being done under AST-7622109A01.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0020, STUDIES OF SUPERNOVAE AND SUPERNOVA REMNANTS

R.P. Kirshner, University of Michigan, Ann Arbor Campus, School of Literature Science & the Arts, Dept. of Astronomy, *Ann Arbor, Michigan* 48104 (AST77-17600 A01)

This project will be concerned with studies of the properties of supernovae. Spectrophotometry of extragalactic supernovae will be carried-out in order to establish the type and age of supernovae. The spectra will be used to obtain a physical and chemical analysis of these objects. Distances to these supernovae will also be determined. Supernova remnants in our galaxy and the Andromeda galaxy will be observed in order to obtain information on the evolution of the remnants and conditions in the interstellar medium.

The work will make use of the facilities at the McGraw-Hill Observatory at Kitt Peak. The telescope is equipped with a television guider that will permit easy acquisition of objects as faint as 18th magnitude. Spectral scans will be obtained with a 2000-channel intensified reticon scanner.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0021, STUDIES OF THE DYNAMICS OF ELLIPTICAL GALAXIES

M. Schwarzschild, Princeton University, Graduate School, Dept. of Astrophysical Sciences, *205 Nassau Hall, Princeton, New Jersey* 08540 (AST78-23796)

Elliptical Galaxies have long been considered as giant stellar systems, each rotating around its axis and having a symmetrical figure around this axis (such as oblate spheroids). In recent years, however, observtional and theoretical indications have been uncovered which suggest that this earlier picture may be an oversimplification and that the true figures of Elliptical Galaxies may be significantly more complicated (such as tri-axial elipsoids). The question then arises whether tri-axial stellar systems can exist in long-lasting dynamical equilibrium, a necessary condition for models of Elliptical Galaxies. It is here proposed to approach this question numerically, but not by N-body calculations. In contrast to this latter approach, tri-axial configuration appropriate for an Elliptical Galaxy is chosen from the outset. Next, the gravitational force exerted by this configuration on any star within it is derived. Third, stellar orbits following this force are computed, one at a time, in contrast with N-body computations. Finally, according to the proposed plan, each orbit is statistically occupied by a certain number of stars such that all the stars on all the orbits together reproduce the configuration chosen at the outset. If this last step succeeds in as conclusive a manner as can be hoped for from a numerical approach (in contrast to a basic mathematical approach, if feasible), then tri-axial configurations would appear likely better models for the majority of Elliptical Galaxies than the earlier axially symmetrical ones and new questions regarding their mode of origin would arise.

This is a continuation of AST-7522924A02.

SUPPORTED BY U.S. National Science Foundation,
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of Astronomical Sciences

10.0022, STUDIES OF THE STRUCTURE AND DISTRIBUTION OF INTERSTELLAR MOLECULAR CLOUDS AND THE THEORY OF WATER MASERS

M. Morris, Columbia University, School of Arts & Sciences, Dept. of Astronomy, *Broadway & W. 116th St., New York, New York* 10027 (AST79-02601)

There are four facets to the research on interstellar molecular gas. The first is an observational study of cloud edges. The goal is to determine the relative depths of the many layers of neutral hydrogen (HI), molecular hydrogen (H2), ionized carbon, (C ion), carbon monoxide (CO), at the interfaces between molecular clouds and the interstellar medium. Theories of molecule formation will be tested by deriving a model for the interstellar ultraviolet radiation field. The second project is an observational study of filamentary molecular clouds. Known examples will be studied in order to determine their mass, their alignment with the local galactic magnetic field, and their detailed velocity field. The third area of research is the molecular cloud component of external galaxies. Observations with a new generation of receivers will be made of the CO distribution in nearby spiral galaxies. The direct determination of CO (thus H2) distributions, in tandem with 21-cm. observations, is of great importance for models of galactic evolution. A comparison of the molecular gas in nearby spirals with that in the galaxy will be made. The fourth area is a theoretical study of water (H2O) masers from star formation regions. Radiative transfer calculations will be undertaken within the previously-proposed geometrical framework of a molecular disk surrounding a luminous star. The goal will be to make predictions about the shapes of individual maser spots that can be tested.

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10.0023, STUDIES OF DEGENERATE STARS

H.M. VanHorn, University of Rochester, School of Arts & Sciences, Dept. of Physics & Astronomy, *260 Crittenden Blvd., Rochester, New York* 14627 (AST79-09391)

This project will be concerned with several areas of degenerate star research. The atmospheres, the internal structure and evolution, and the nonradial oscillations of white dwarf stars will be studied. The effects of accretion upon the surface layers of white dwarf stars will be examined. There will be a study of the structure and evolution of cooling and accreting neutron stars. Work on the development of computer codes to permit the calculation of self-consistent, quasi-static models of the evolution of rotating neutron stars will be continued. There will also be research on the evolution of magnetic fields in degenerate stars.

SUPPORTED BY U.S. National Science Foundation,
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of Astronomical Sciences

10.0024, OBSERVATIONS OF BINARY AND PROPER-MOTION STARS

W.D. Heintz, Swarthmore College, Graduate School, Dept. of Astronomy, *Swarthmore, Pennsylvania* 19081 (AST79-06379)

Visual observations by micrometer, spectroscopic, and photographic measurements jointly assist in revealing the properties of binary and multiple stars and of nearby dwarf stars. Principal goals are: Improvement and increase of data on orbital motions, periods, and masses in binary systems; search for undiscovered binary stars, or additional components in known binaries; study of the apparently low incidence of binaries among faint red

stars, and study of small proper-motion errors in connection with the problem of the apparently low incidence of nonluminous companions.

The 61 cm refractor at Swarthmore college is the principal instrument used by the Investigator with the micrometer, to about 12 or 15% of telescope time. Additional micrometer work and other observations are planned at Kitt Peak and Cerro Tololo Observatories.

Prior support was under NSF grant AST 77-12236.

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10.0025, GENERAL THEORETICAL STUDIES OF STELLAR CHROMOSPHERES, CORONAE, AND TRANSITION LAYERS

R. Erika, University of Washington, School of Arts & Sciences, Dept. of Astronomy, *Seattle, Washington* 98105 (AST78-21024)

The temperature of a star generally decreases as one goes from the interior to the outer atmosphere. We know, however, that in the outer layers of the Sun the temperatre increases from 5800 degrees at the base of the photosphere to 10,000 degrees in the chromosphere to 1.5 million degrees in the corona. If the only form of energy transport is through radiative processes, then such temperatures could not occur in the corona. It is clear that the chromosphere and corona of the Sun must be heated by some form of nonthermal energy like soundwaves, shockwaves, or magneto-hydrodynamic waves. The exact manner in which the solar chromosphere and corona are heated and how this heating depends on height remains uncertain.

It is now possible to observe chromospheres and coronae in other stars. Observations of different stars show large variations in radiation from these layers. The studies that will be carried-out will be aimed at determining how the temperature and pressure stratifications and the radiation from the chromosphere and transition layer depend on the heating mechanisms. This will enable one to determine how the observed differences in the observations relate to differences in chromospheric structure and heating.

SUPPORTED BY U.S. National Science Foundation,
Directorate for Astronomical
Atmospheric Earth & Ocean Scis., Div.
of Astronomical Sciences

10.0026, PUBLICATION OF THE ATLAS OF THE ANDROMEDA GALAXY

P.W. Hodge, University of Washington, School of Arts & Sciences, Dept. of Astronomy, *Seattle, Washington* 98105

An extensive photographic atlas of the Andromeda Galaxy has been prepared with the help of a grant from the National Geographic Society. The photographs for the atlas were taken at the Kitt Peak National Observatory, using the 158-inch telescope. The result is the first complete, large-scale identification atlas of this galaxy, which is the nearest spiral galaxy to ours. The atlas consists of forty 10-inch by 10-inch photographic charts, along with overlays giving the brightness contours of the galaxies, and is accompanied by extensive tables of data on the objects identified on the charts. These various objects include all known globular star clusters, all known open star clusters, the stellar associations, the dark nebulae, and several other kinds of identified features in the galaxy. Altogether, these total over 2,000 objects. The atlas is intended for astronomers and astronomy students, who can gain understanding of the structure and content of spiral galaxies from its study and who can use the charts at the telescope to plan and carry-out new research.

SUPPORTED BY National Geographic Society

10.0027, SURVEY OF SPECTRAL AND POLARIMETRIC VARIABLE QUASI-STELLAR OBJECTS

K.H. Nordsieck, University of Wisconsin, Madison Campus, School of Letters & Science, Dept. of Astronomy, *500 Lincoln Dr., Madison, Wisconsin* 53706 (AST77-06977 A02)

The project involves an observational search for members of the class of quasi-stellar objects often called 'violent variables,' using a portable multi-channel spectropolarimeter built at the University of Wisconsin, mounted on the Cassegrain spectrograph of the 4-meter telescope of the Kitt Peak National Observatory. This instrument is particularly suited for such a project in that it obtains the spectrum (9 Angstrom resolution) and polarization (50-200 Angstrom resolution) of an object simultaneously over 4000 Angstroms. A Kitt Peak compatible version of this instrument has been completed as part of the first phase of this project. Polarized variable candidates for these observations will be obtained from lists of optically identified quasi-stellar objects (QSOs) and radio compact variable sources. Members of this class would be rapidly identified from their characteristically large optical polarization (often 5-30 percent). Additional integration time will give a more exact value of the polarization and the details of the spectrum would be available. Unprofitable telescope time on chance foreground stars would thus be avoided. This class of objects is important in that the variability provides clues to the still mysterious central energy source of quasi-stellar objects and to the relationship of the optical and radio objects. With a moderate list of active sources, a correlation of variability and spectrum could be attempted, and the chances of any one object exhibiting rapid variability during an observing session would be enhanced.

This is a continuation of AST-7706977.

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of Astronomical Sciences

10.0028, IMPROVED INFRARED ARRAY SPECTROMETER SYSTEMS AT THE UNIVERSITY OF WYOMING

R.D. Gehrz, University of Wyoming, School of Arts & Sciences, Dept. of Physics & Astronomy, *P.O. Box 3435, University Station, Laramie, Wyoming* 82070 (AST79-05131)

A new program to develop improved array detectors for infrared astronomy will be started at the University of Wyoming. Construction of new and efficient spectrometers of advanced design will be completed. They will be provided with arrays of state-of-the-art photoconductive detectors. The new detectors will enable the full potentialities of the new spectrometer systems to be fully realized.

The array spectrometer systems will be used in observational programs now being conducted with the 92-inch telescope of the Wyoming Infrared Observatory. The scientific thrust of these programs is to improve our understanding of the formation and death of stars. Observations of regions of high stellar formation activity such as the Orion Nebula will be continued as will studies of such highly-evolved stellar systems as classical novae, Wolf Rayet stars and old dust cocoon stars.

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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N80-16023* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY, SUPPLEMENT 116
Dec. 1979 166 p
(NASA-SP-7037(116)) Avail: NTIS HC E02 CSCL 01A

This bibliography lists 550 reports, articles, and other documents introduced into the NASA scientific and technical information system in November 1979. Author

N80-16024*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NASA QUIET SHORT-HAUL RESEARCH AIRCRAFT EXPERIMENTERS' HANDBOOK
Robert C. McCracken Jan. 1980 29 p
(NASA-TM-81162; A-8053) Avail: NASA. Ames Research Center, Moffett Field, Calif. 94035 CSCL 02A

A summary of guidelines and particulars concerning the use of the NASA-Ames Research Center Quiet Short-Haul Research Aircraft for applicable flight experiments is presented. Procedures for submitting experiment proposals are included along with guidelines for experimenter packages, an outline of experiment selection processes, a brief aircraft description, and additional information regarding support at Ames. J.M.S.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N80-16025 Virginia Univ., Charlottesville.
PREDICTING TRANSITION TO TURBULENCE IN THE COMPRESSIBLE BOUNDARY LAYER FLOW OVER A SPINNING CONE Ph.D. Thesis
Peter A. Torpey 1979 134 p
Avail: Univ. Microfilms Order No. 8002543

A method was developed for theoretically predicting where the transition from laminar to turbulent flow occurs in the boundary layer over a spinning cone at an angle of attack in supersonic flight. It is based on the linear stability theory for a viscous, compressible fluid. Using this theory, small disturbances are followed as they amplify and propagate along the surface of the cone. By correlating theoretically obtained disturbance amplitudes with experimental data, it is possible to develop a meaningful criterion for determining the location of transition. The method is successful in correlating theory and experiment for a 10 half-angle cone in supersonic flight. The results presented indicate how the location of transition over the cone is influenced by spin rate, angle of attack, and Mach number. Dissert. Abstr.

N80-16026 California Univ., Los Angeles.
THE MOTION OF A VORTEX PAIR IN A STRATIFIED MEDIUM Ph.D. Thesis
Jack Dickran Tomassian 1979 133 p
Avail: Univ. Microfilms Order No. 8001414

An experiment was constructed to simulate and study the motion of a vortex pair in a stratified atmosphere. The vortex trajectories indicate that the pair initially accelerates and its separation decreases when stratification is dominating, in agreement with Crow's theoretical predictions. However, a short time later, the speed of the pair decreases and its separation increases in the stratified as well as the unstratified cases. A peak in the trajectories is observed to occur at an Nt of 2.4 for all Nb sub 0/V sub 0, in agreement with observations from real aircraft. The increase in separation is caused by turbulence, and the data agree with recent numerical computations of vortex pair trajectories in a stratified medium with turbulence. As stratification is increased, the separation and the speed of the pair decreases relative to the unstratified case due to counter-sign vorticity at the boundary of the recirculation cell. Dissert. Abstr.

N80-16027 Cincinnati Univ., Ohio.
MAXIMUM LIKELIHOOD IDENTIFICATION OF AIRCRAFT PARAMETERS WITH UNSTEADY AERODYNAMIC MODELLING Ph.D. Thesis
Dinesh Achyut Keskar 1979 105 p
Avail: Univ. Microfilms Order No. 8002115

A simplified aerodynamic force model based on the physical principle of Prandtl's lifting line theory and trailing vortex concept has been developed to account for unsteady aerodynamic effects in aircraft dynamics. An indicial lift function associated with circulation has been derived for tapered, swept wings in incompressible flow by representing the wings with a simple vortex system. Similarly, an equation is developed to compute downwash at the tail caused by wing lift. The equations derived are approximated by the convenient exponential functions. A family of curves is plotted for the constants in the exponential functions for various aspect ratios, taper ratios and sweep angles at the wing quarter-chord line. The results from these approximations compare well with the limited available results from more rigorous and complex methods. Dissert. Abstr.

N80-16028 Stanford Univ., Calif.
A GENERAL METHOD TO DETERMINE THE STABILITY OF COMPRESSIBLE FLOWS Ph.D. Thesis
Rolf Adolf Guenther 1979 133 p
Avail: Univ. Microfilms Order No. 8001932

The stability equation based on one dependent variable was found and was examined to determine the stability of a compressible swirling jet. The results obtained were very similar to those of Lallas for finite domains. There are differences that could be explained to slight changes in initial assumptions and also due to the fact that the interval of integration is all space rather than a finite subspace. The second approach was that of

using a Lagrangian approach to the problem. Since the equations developed were based on different assumptions, the condition of stability was compared only for the Rayleigh problem of a swirling flow; both examples reduce to the Rayleigh criterion. The second method allows including the viscous shear terms which is not possible in the first method. The same problem was again examined to see what effect shear has on stability.
Dissert. Abstr.

N80-16029 Engineering Sciences Data Unit, London (England).
AVERAGE GUST FREQUENCIES SUBSONIC TRANSPORT AIRCRAFT
1979 43 p Supersedes ESDU-69023
(ESDU-69023-A-B-C; ESDU-69023; ISBN-0-85679-259-4) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $578.50

Data is provided for compilation of the cumulative frequency gust spectrum experienced by an aircraft structure. An estimation of fatigue loading encountered by aircraft wing structures in flight is presented.
ESDU

N80-16030*# McDonnell Aircraft Co., St. Louis, Mo.
INVESTIGATION OF GROUND EFFECTS ON LARGE AND SMALL SCALE MODELS OF A THREE FAN V/STOL AIRCRAFT CONFIGURATION
E. P. Schuster, T. D. Carter, and D. W. Esker Jul. 1979 149 p refs
(Contract NAS2-9690)
(NASA-CR-152240; MDC-A5702) Avail: NASA, Ames Research Center, Moffett Field, Calif. Attn: Hervey Quigley CSCL 01A

Induced lift of a subsonic, three fan, lift/cruise, V/STOL aircraft configuration was investigated using scale modes of a multimission aircraft whose design incorporates a nose mounted lift fan and two lift/cruise units located over the wing. Configuration effects were assessed for lift improvement devices, lift/cruise nozzle rails, nozzle perimeter plates, and alternate nose fan exit hubs. Tests were conducted at four model heights (H/D = 0.95, 1.53, 3.06 and 6.45, where D is the average nozzle exit diameter equal to 0.997 m.) Results are presented and discussed.
A.R.H.

N80-16031*# Vought Corp., Dallas, Tex.
APPLICATION OF NUMERICAL OPTIMIZATION TO THE DESIGN OF WINGS WITH SPECIFIED PRESSURE DISTRIBUTIONS Final Report
H. P. Haney and R. R. Johnson Feb. 1980 108 p
(Contract NAS2-9653)
(NASA-CR-3238) Avail: NTIS HC A06/MF A01 CSCL 01A

A practical procedure for the optimum design of transonic wings is demonstrated. The procedure uses an optimization program based on the method of feasible directions coupled with an aerodynamic analysis program which solves the three-dimensional potential equation for subsonic through transonic flow. Two new wings for the A-7 aircraft were designed by using the optimization procedure to achieve specified surface pressure distributions. The new wings, along with the existing A-7 wing, were tested in the Ames 11 ft transonic wind tunnel. The experimental data show that all of the performance goals were met. However, comparisons of the wind tunnel results with the theoretical predictions indicate some differences at conditions for which strong shock waves occur.
Author

N80-16032*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
WIND-TUNNEL/FLIGHT CORRELATION STUDY OF AERODYNAMIC CHARACTERISTICS OF A LARGE FLEXIBLE SUPERSONIC CRUISE AIRPLANE (XB-70-1) 2: EXTRAPOLATION OF WIND-TUNNEL DATA TO FULL-SCALE CONDITIONS
John B. Peterson, Jr., Michael J. Mann, Russell B. Sorrells, III, Wallace C. Sawyer, and Dennis E. Fuller Feb. 1980 80 p refs
(NASA-TP-1515; L-12688) Avail: NTIS HC A05/MF A01 CSCL 01A

The results of calculations necessary to extrapolate performance data on an XB-70-1 wind tunnel model to full scale at Mach numbers from 0.76 to 2.53 are presented. The extrapolation was part of a joint program to evaluate performance prediction techniques for large flexible supersonic airplanes similar to a supersonic transport. The extrapolation procedure included: interpolation of the wind tunnel data at the specific conditions of the flight test points; determination of the drag increments to be applied to the wind tunnel data, such as spillage drag, boundary layer trip drag, and skin friction increments; and estimates of the drag items not represented on the wind tunnel model, such as bypass doors, roughness, protuberances, and leakage drag. In addition, estimates of the effects of flexibility of the airplane were determined.
J.M.S.

N80-16033*# McDonnell-Douglas Corp., St. Louis, Mo.
DEVELOPMENT OF PANEL METHODS FOR SUBSONIC ANALYSIS AND DESIGN Final Report
D. R. Bristow Feb. 1980 84 p refs
(Contract NAS1-15369)
(NASA-CR-3234) Avail: NTIS HC A05/MF A01 CSCL 01A

Two computer programs, developed for subsonic inviscid analysis and design are described. The first solves arbitrary mixed analysis design problems for multielement airfoils in two dimensional flow. The second calculates the pressure distribution for arbitrary lifting or nonlifting three dimensional configurations. In each program, inviscid flow is modelled by using distributed source doublet singularities on configuration surface panels. Numerical formulations and representative solutions are presented for the programs.
A.W.H.

N80-16034# Naval Air Development Center, Warminster, Pa.
THE AERODYNAMICS OF A JET IN A CROSSFLOW Final Report
K. T. Yen 11 Dec. 1978 62 p refs
(AD-A076375; NADC-78291-60) Avail: NTIS HC A04/MF A01 CSCL 01/1

The aerodynamics of a jet in a crossflow considered as the key problem in transition aerodynamics for VSTOL aircraft were reviewed. Experimental results on the flow structure of the jet, the contrarotating vortices, the jet entrainment phenomenon, and the surface pressure distributions were analyzed. The influences on these characteristics by the jet parameters such as the velocity ratio, injection angle and jet orifice shape were considered based on available measurements. In the theoretical area, particular attention was directed to the methods of prediction and analysis, and the fundamental physical bases of these methods. Current developments in transition aerodynamics, and some recent work on the formation of contrarotating vortices and the wake flow are described.
F.O.S.

N80-16035*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WING FLAPPING WITH MINIMUM ENERGY
R. T. Jones Jan. 1980 18 p refs
(NASA-TM-81174; A-8076) Avail: NTIS HC A02/MF A01 CSCL 01A

For slow flapping motions it is found that the minimum energy loss occurs when the vortex wake moves as a rigid surface that rotates about the wing root - a condition analogous to that determined for a slow-turning propeller. The optimum circulation distribution determined by this condition differs from the elliptic distribution, showing a greater concentration of lift toward the tips. It appears that very high propulsive efficiencies are obtained by flapping.
Author

N80-16036*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A COMPARISON OF CALCULATED AND EXPERIMENTAL LIFT AND PRESSURE DISTRIBUTIONS FOR SEVERAL HELICOPTER ROTOR SECTIONS
John Conlon Jan. 1980 33 p refs
(NASA-TM-81160; A-8029) Avail: NTIS HC A03/MF A01 CSCL 01A

The use of computational techniques in predicting lift coefficients and pressure distributions of two dimensional airfoil sections was studied. The computer code FL06/IBL was used to solve the compressible, two dimensional flow about four different airfoil sections. The lift coefficients of the airfoils were

calculated at various angles of attack at subsonic Mach numbers and compared with experimental data. A.W.H.

N80-16037# Systems Research Labs., Inc., Newport News, Va. RASA Div.

SUMMARY OF THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF VORTEX LIFT AT HIGH ANGLES OF ATTACK Final Report, 1 Jan. 1974 - 31 Mar. 1979

D. S. JanakiRam, Satish S. Samant, and Richard P. White, Jr. May 1979 166 p refs

(Contract N00014-74-C-0091)

(AD-A074483; RASA/SRL-14-79-03; ONR-CR-212-223-5-F) Avail: NTIS HC A08/MF A01 CSCL 20/4

This summary report presents the development and verification of a theoretical prediction method for predicting aerodynamic characteristics of low aspect ratio and delta wings at high angles of attack. A summary of the experimental measurements made on low aspect ratio swept wings with leading edge vortex devices is presented as well as a discussion of the final computer program that was developed and correlated with experimental data obtained on swept and delta wings during the last year of the contract effort. GRA

N80-16038# Sandia Labs., Albuquerque, N. Mex. Aeroballistics Projects Div.

INSTRUMENTATION MODELING TECHNIQUE USED IN THE IDENTIFICATION OF AERODYNAMIC COEFFICIENTS FROM FLIGHT TEST DATA

W. E. Williamson, Jr. 1978 13 p refs Presented at the Astronautical Congr., Dubrovnik, Yugoslavia, 1 Oct. 1978

(Contract EY-76-C-04-0789)

(SAND-78-0721C; CONF-781037-1) Avail: NTIS HC A02/MF A01

A number of estimation methods used to compute aerodynamic coefficients of ballistically flown spinning vehicles often ignore possible phase shifts between data and the model of the motion. Some of these problems occur because onboard instrumentation such as rate gyros or accelerometers behave like spring mass systems. If the vehicle motion is near the resonance frequency of the instrument, then the output of the instrument is shifted in phase from the actual motion and probably the model representation of the motion. In order to demonstrate this problem, the aerodynamic coefficients of a spinning vehicle are computed from actual flight test data using a standard least squares estimation scheme. The problem just described is shown to exist for that data. A modeling scheme is derived to compensate for the instrumentation-induced changes in the data. The results obtained using the instrumentation modeling scheme are shown to be much better than those obtained using a standard scheme. DOE

N80-16039# Sandia Labs., Albuquerque, N. Mex. System Studies Dept.

AERODYNAMIC COEFFICIENT ESTIMATION BY MEANS OF AN EXTENDED KALMAN FILTER

James R. Kelsey 1979 19 p refs Presented at the Atmospheric Flight Mech. Conf., Boulder, Colo., 6 Aug. 1979 Prepared in cooperation with New Mexico Univ., Albuquerque

(Contract EY-76-C-04-0789)

(SAND-79-0411C; CONF-790826-1) Avail: NTIS HC A02/MF A01

An extended, augmented Kalman filter is used to study several dynamic models of vehicle motion aimed at estimating the aerodynamic moment coefficients. These models consider various state representations as well as various measurement sets. Linear and cubic symmetric moments are considered as well as linear asymmetric moments. Computer generated data representative of a reentry vehicle flight are used as the simulated measurement information. Coefficient estimates and error estimates are given for each of the models studied. The computer time required for estimate convergence is also shown, indicating that near-real-time estimation is possible. DOE

N80-16040# Maryland Univ., College Park. Dept. of Mechanical Engineering.

A STUDY OF AERODYNAMIC METHODS FOR IMPROVING TRUCK FUEL ECONOMY

Frank T. Buckley, Jr., Colin H. Marks, and William H. Walston, Jr. Dec. 1978 404 p refs

(Grant NSF SIA-74-1843)

(PB80-101272; NSF/RA-780680) Avail: NTIS HC A18/MF A01 CSCL 13F

Results of a 3-year program to investigate aerodynamic means to reduce fuel consumption of tractor-trailer trucks are reported. The study considers the benefit of aerodynamic add-on devices to reduce the aerodynamic drag on existing vehicles, and the influence of design alternatives in reducing the drag of future vehicles. Drag reductions of both commercial and newly-developed retrofit drag reducing devices are evaluated. Full scale test results indicate that wind turbulence effects cause the full-scale drag reductions produced by retrofit devices to be generally less than those found in the wind tunnel. The decrease is found to be a function of the design of the device and the ambient conditions in which it is used. GRA

N80-16041# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.

THE AERODYNAMICS OF TRACKED RAM AIR CUSHION VEHICLES - EFFECTS OF PITCH ATTITUDE AND UPPER SURFACE FLOW Final Report, Sep. 1973 - Feb. 1979

T. M. Barrows, H. C. Curtiss, Jr., and W. F. Putman Oct. 1979 141 p refs

(Contract DOT-TSC-682)

(PB80-101827; MAE/TR-1426; DOT-TSC-RSPA-79-17) Avail: NTIS HC A07/MF A01 CSCL 13F

Three types of experiments were conducted on geometrically similar models of a Tracked Ram Air Cushion Vehicle (TRACV): (1) wind tunnel tests with the vehicle model positioned within a short segment of stationary guideway; (2) the vehicle model was towed through a 300-foot guideway and the equilibrium position was measured as a function of model weight and center-of-gravity location; and (3) a moving carriage which held the model at a fixed orientation relative to the guideway. Simplified theories are developed for the flow over the upper surface of the model and for the effect of pitch attitude on the flow under the lower surface. The level of agreement between the theory and the various testing techniques is discussed. GRA

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation and 85 Urban Technology and Transportation.*

N80-16042*# National Aeronautics and Space Administration, Washington, D. C.

POSSIBLE MARKETS FOR DIRIGIBLES

Dec. 1979 110 p Transl. into ENGLISH of "Les Marches Possibles du Dirigeable", Rept. from Secretariat d'Etat aupres du Ministre de l'Equipement (Transports), Paris, Sep. 1977 p 1-132 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Transconsult, Paris

(Contract NASw-3199)

(NASA-TM-75937) Avail: NTIS HC A06/MF A01 CSCL 01C

The use of mini, small, medium, and heavy dirigibles for the transportation of passengers and cargo, for aerial handling of materials, for the support of scientific platforms, and for use in agriculture and forest management is evaluated. The operational efficiency of one or more dirigibles in view of possible integration into the general transport system is described. A.R.H.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N80-16043# National Aviation Facilities Experimental Center, Atlantic City, N. J.
AIR TRAFFIC CONTROL/FULL BEACON COLLISION AVOIDANCE SYSTEM, KNOXVILLE SIMULATION Final Report, Apr. - May 1978
B. Billmann, T. Morgan, R. Strack, and J. Windle Aug. 1979 47 p refs
(FAA Proj. 052-241-310)
(AD-A074555; FAA-RD-79-25) Avail: NTIS HC A03/MF A01 CSCL 17/7

The interaction between a full beacon collision avoidance system (BCAS) and the present air traffic control (ATC) system in a real-time simulation environment was investigated to determine the impact of BCAS on controllers and control procedures, the requirement of BCAS information to be displayed to the controller, and the effectiveness of alarm threshold desensitization in a terminal area. An additional objective was to evaluate the BCAS algorithm performance in terms of number, duration, and location of alerts and resolution effectiveness. Analysis of results indicates that the presence of BCAS in a moderate-density ATC terminal environment has no adverse effect on controllers or control procedures because of an extremely low positive command rate. A high number of BCAS advisory alerts which were displayed to aircraft but not to controllers had no effect on aircraft flightpaths. Many of these alerts were generated for aircraft navigating on established airways with proper ATC separation. A significant number of participating controllers favored the use of BCAS as a backup to the ATC system.
A.R.H.

N80-16044# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE AIRCRAFT REPLY AND INTERFERENCE ENVIRONMENT SIMULATOR (ARIES). VOLUME 1: PRINCIPLES OF OPERATION
Michael Goon and David A. Spencer 22 Mar. 1979 288 p
(Contracts DOT-FA77WAI-261; F19628-78-C-0002; FAA Proj. 052-241-04)
(AD-A074542; FAA-RD-78-96; ATC-87-Vol-1) Avail: NTIS HC A11/MF A01 CSCL 17/7

The operation of ARIES hardware and software is presented. Descriptive information, supported by block diagrams, simplified schematic diagrams and flow diagrams, is provided.
M.M.M.

N80-16045# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE AIRCRAFT REPLY AND INTERFERENCE ENVIRONMENT SIMULATOR (ARIES). VOLUME 2: APPENDICES TO THE PRINCIPLES OF OPERATION
Michael Goon and David A. Spencer 22 Mar. 1979 112 p
(Contracts DOT-FA77WAI-261; F19628-78-C-0002; FAA Proj. 052-241-04)
(AD-A074482; FAA-RD-78-96; ATC-87-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 17/7

Articles are appended to provide: (1) explanations of design and programming aspects of the ARIES; (2) data format and data structure definitions; (3) detailed explanations of the meaning of ARIES error messages and an analysis of certain effects which may be expected when more than one ARIES simulators are interconnected to permit testing adjacent to DABS sensors.
M.M.M.

N80-16046# Quanta Systems Corp., Rockville, Md.
OPTIMUM INTENSITY SETTING OF APPROACH AND RUNWAY LIGHT SYSTEMS Final Report, period ending 20 Aug. 1979
Charles A. Douglass 20 Aug. 1979 86 p refs
(Contracts DOT-FA77WAI-786; N68335-78-C-2022)
(AD-A075485; FAA-RD-79-87) Avail: NTIS HC A05/MF A01 CSCL 17/7

Criteria for determining the optimum intensity settings of approach and runway lights as a function of atmospheric transmissivity and/or meteorological visibility, were developed. In determining the optimum intensity settings, consideration was given to past practices, theoretical and experimental studies, and to the effects of the intensity setting on runway visual range. Changes in the present intensity setting criteria are recommended.
J.M.S.

N80-16047# Westinghouse Defense and Electronic Systems Center, Baltimore, Md. Command and Control Div.
DIPOLE BROADSIDE GLIDE SLOPE ARRAY Final Report, Nov. 1973 - May 1979
R. S. Littlepage and R. Rajnic Washington DOT May 1979 94 p
(Contract DOT-FA74WA-3353)
(AD-A077042; FAA-RD-79-69) Avail: NTIS HC A05/MF A01 CSCL 09/5

The analysis and design, and the fabrication and test of an improved glide slope antenna system are presented. It is capable of providing CAT II performance over level ground, rising ground, and severe broken ground associated with problem sites. It is broadband and can operate at any ILS glide slop frequency with no special tuning. A monitoring technique was developed which is applicable to any antenna system consisting of a large number of radiators. The report contains the results of antenna range measurements and flight check data taken at a typical site.
M.M.M.

N80-16048# National Aviation Facilities Experimental Center, Atlantic City, N. J.
TRANSPONDER PERFORMANCE ANALYZER (TPA) Final Report, Mar. 1976 - Mar. 1978
Carl Hazelwood Oct. 1979 33 p
(FAA Proj. 031-241-830)
(AD-A075783; FAA-RD-79-54; ANA-180) Avail: NTIS HC A03/MF A01 CSCL 17/7

The Transponder Performance Analyzer (TPA) used for measurement of aircraft beacon transponder performance characteristics is described. The system was developed at NAFEC utilizing both in-house designed and commercially available equipment. The system is fully self-supporting, is housed in a mobile bus, and has been used for ramp testing of transponders operating in general aviation aircraft and for bench testing of off-the shelf units.
M.M.M.

N80-16049# Mitre Corp., McLean, Va. Metrek Div.
EVALUATION OF THE POTENTIAL FOR REDUCED LONGITUDINAL SPACING ON FINAL APPROACH
William J. Swedish Washington DOT Aug. 1979 126 p refs
(Contract DOT-FA79WA-4184)
(AD-A076434; FAA-EM-79-7; MTR-79W00280) Avail: NTIS HC A07/MF A01 CSCL 17/7

The feasibility of reduced IFR separation standards on final approach is addressed as well as the identification of the characteristics of the ATC system which affect or are affected by the separation standards. The conditions were limited to those times during which wake turbulence is not a factor. Given this assumption, separation reduction is limited by the need to avoid simultaneous runway occupancy by successive arrivals. Various technical improvements now under development may make it possible to operate a 2.0 nmi minimum with average runway occupancies as great as 45-50 seconds. Adequate communications and surveillance for the controller, and enforcement of current ATC procedures are also required for operations with reduced separations. An alternative solution to the runway occupancy problem is to use a pair of closespaced, dependent (dual-lane) runways and alternate arrivals between them. Reduced separation on approach to a single runway cannot be realized until the wake vortex problem is resolved. Although there do not appear to be any other technical or operational barriers to reduced separation standards, additional research is required before reduced standards can be implemented.
M.M.M.

N80-16050# Federal Aviation Agency, Washington, D.C. Office of Systems Engineering Management.
REPORT OF THE FAA TASK FORCE ON AIRCRAFT

SEPARATION ASSURANCE. VOLUME 1: EXECUTIVE SUMMARY
N. A. Blake Jan. 1979 37 p refs
(AD-A075352; AEM-2; FAA-EM-78-19-1-Rev-Vol-1) Avail: NTIS HC A03/MF A01 CSCL 17/7

A task force developed FAA engineering and development consensus on the integrated aircraft separation assurance system for the National Airspace System is presented. A study of system errors, mid-airs, and near mid-airs to define the problem is described. The system element requirements are defined to provide two levels of backup to the air traffic control system: a separation violation warning and a final fail safe collision advisory and resolution function. R.E.S.

N80-16051*# Ohio Univ., Athens. Avionics Engineering Center.
RESULTS OF A LORAN-C FLIGHT TEST USING AN ABSOLUTE DATA REFERENCE
Joseph P. Fischer Jan. 1980 22 p refs
(Grant NGR-36-009-017)
(NASA-CR-162751; TM-74) Avail: NTIS HC A02/MF A01 CSCL 17G

A closed circuit flight test was conducted in the Boston area using VOR's and NDB's as reference points. The Loran-C data collected during the flight was then compared against a reference provided by the Discrete Address Beacon System (DABS) facility at Lincoln Laboratories. A MIT crew used a commercial receiver and recorded Loran-C time differences which would also be compared with the data provided by the DABS facility and eventually with the data collected by Ohio University. The Ohio University low-cost receiver was used for this test which was conducted in the Ohio University DC-3 flying laboratory. The Loran-C time-difference data was recorded with a microcomputer data collection system and stored on magnetic tape for subsequent analysis. The MIT receiver was also on board the DC-3, and recorded its data on a cassette tape which was later used by the MIT crew for data analysis. The equipment configuration in the aircraft, the flight procedure and the results obtained from the data collected with Ohio University's receiver and recording system are described. A.R.H.

N80-16052# Hawaii Univ., Honolulu.
LONG-RANGE ELECTRONIC NAVIGATION SYSTEMS IN THE HAWAIIAN ARCHIPELAGO
James Kennedy, Susan Holt, and Peter Hendricks May 1979 6 p refs
(PB-300842/2; UNIHI-SEAGRANT-AB-79-06; NOAA-79082107) Avail: NTIS HC A02/MF A01 CSCL 17G

Electronic navigation systems operational in the Hawaiian Archipelago are considered. These include: Loran-A, Loran-C, Omega, and satellite navigation. The Loran-A system is scheduled to be phased out and users must switch to an alternative system. Information on the three continuing systems is given in order to help the navigator select an appropriate system. Fix accuracy (absolute and repeatable), area coverage, and receiver cost are given for each system. The Loran-C system is emphasized. GRA

N80-16053# National Technical Information Service, Springfield, Va.
COLLISION AVOIDANCE SYSTEMS. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Aug. 1979
Guy E. Habercom, Jr. Sep. 1979 391 p Supersedes NTIS/PS-78/0883; NTIS/PS-77/0765; NTIS/PS-76/0682; NTIS/PS-75/671; NTIS/PS-75/036
(NTIS/PS-79/0960/9; NTIS/PS-78/0883; NTIS/PS-77/0765; NTIS/PS-76/0682; NTIS/PS-75/671; NTIS/PS-75/036) Avail: NTIS HC $28.00/MF $28.00 CSCL 01B

Collision avoidance systems in three modes of transportation (i.e. air, surface, marine) are investigated. Traffic scheduling, automatic ground based stations, and on board warning systems for air transportation are discussed. The sensors and detectors relative to marine transportation collision avoidance are examined. Engineering research relative to highway and rail collision avoidance is reported. This bibliography contains 383 abstracts, 45 of which are new entries to the previous edition. GRA

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics.

N80-16054 Cincinnati Univ., Ohio.
PARAMETER IDENTIFICATION OF FLEXIBLE FLIGHT VEHICLES ASSUMING A LOW-REDUCED-FREQUENCY AERODYNAMIC REPRESENTATION Ph.D. Thesis
Robert Charles Schwanz 1979 184 p
Avail: Univ. Microfilms Order No. 8002138

The derivation and numerical demonstration of a recursive, sequential least squares method that may be used to identify the steady and unsteady aerodynamic parameters of a flexible vehicle from its flight test measurements is discussed. The state and measurement equations employed result from mathematical approximations of the vehicle dynamics developed using a state reduction procedure. The aerodynamics mathematical approximation considered is based upon a low reduced-frequency expansion of the potential flow equations. These approximations are most applicable to low aspect ratio flight vehicles operating at subsonic and supersonic speeds. It is demonstrated that the aerodynamic parameters may be estimated if the static aeroelastic measurement residual is employed to guide the reduction of state, the selection of control inputs, and the location of sensors. Dissert. Abstr.

N80-16055*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
MEANS FOR CONTROLLING AERODYNAMICALLY INDUCED TWIST Patent Application
Wolf Elber, inventor (to NASA) Filed 28 Sep. 1979 10 p
(NASA-Case-LAR-12175-1; US-Patent-Appl-SN-079913) Avail: NTIS HC A02/MF A01 CSCL 01C

A wing twist deformation control mechanism which provides active compensation for aerodynamically induced twist deformation of high aspect ratio wings is described. The twist deformation control mechanism consists of a torque tube, internal to each wing and rigidly attached near the tip of each wing, and an actuator located in the aircraft fuselage. As changes in the aerodynamic loads on the wings occur, the torque tube is rotated to compensate for the induced wing twist. NASA

N80-16056# Kaman Avidyne, Burlington, Mass.
AN EVALUATION OF THE ADINA FINITE ELEMENT PROGRAM FOR APPLICATION TO AIRCRAFT OVERPRESSURE VULNERABILITY Final Report, 12 Nov. 1977 - 31 Oct. 1978
Thomas R. Stagliano and Lawrence J. Menta Feb. 1979 80 p refs
(Contract DNA001-78-C-0057)
(AD-A074261; AD-E300579; KA-TR-162; DNA-4876F) Avail: NTIS HC A05/MF A01 CSCL 01/3

In aircraft overpressure vulnerability, stiffened thin-walled panel configurations are subjected to surface pressure loadings of varying time histories. These dynamic loads subject the impinged structural components to large deflections and an elastic-plastic material response. The ability to predict accurately the deflection and strain time histories of complex aircraft structures of arbitrary geometry has become of increasing importance. The ADINA (Automatic Dynamic Incremental Nonlinear Analysis) computer code is evaluated to determine if it is a numerically accurate, computationally efficient means of analyzing these complex structures under transient pressure loading. In this initial evaluation, the ADINA solutions for clamped beams, simply supported, and clamped flat unstiffened panels and flat stiffened panels subjected to transient pressure loadings are compared with solutions from other nonlinear structural codes. ADINA was found to be an efficient and accurate computer code which provides the full nonlinear capability required for aircraft vulnerability analysis. Shortly, a new version of ADINA will be available that contains a desirable thin shell element. However, ADINA finite elements would still have to be extended to include various shaped stringer and frame cross sections and multilayered skin configurations associated with aircraft structures. GRA

N80-16057# New Mexico Univ., Albuquerque.
TECHNOLOGICAL FORECASTING-AIRCRAFT DESIGN. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1974 - Aug. 1979
Gerald F. Zollars Oct. 1979 32 p Sponsored by NTIS
(INTIS/PS-79/1017/7) Avail: NTIS HC $28.00/MF $28.00
CSCL 01C

Citations to the international literature of technological forecasts of aircraft design changes are reported. Forecasts dealing with the configuration of both civil and military aircraft are included. Specific topics stressed are fuel consumption, avionics, and cost and noise reduction. (Contains 110 citations). GRA

N80-16202*# Rockwell International Corp., El Segundo, Calif.
STATUS OF CAVITY NOISE PHENOMENA MEASUREMENT AND SUPPRESSION ON THE B-1 AIRCRAFT
A. G. Tipton and C. H. Hodson *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 59-66 refs (For primary document see N80-16198 07-16)
Avail: NTIS HC A09/MF A01 CSCL 20A

N80-16226*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
APPLICATION OF RANDOM TIME DOMAIN ANALYSIS TO DYNAMIC FLIGHT MEASUREMENTS
S. R. Ibrahim *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 165-170 refs (For primary document see N80-16211 07-31)
(Grant NsG-1459)
Avail: NTIS HC A10/MF A01 CSCL 01C

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also 19 Spacecraft Instrumentation and 35 Instrumentation and Photography.

No abstracts in this category.

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.

N80-16058*# Grumman Aerospace Corp., Bethpage, N.Y.
INFRARED MEASUREMENTS OF A SCRAMJET EXHAUST Final Report
R. A. Reed and M. W. Slack Jan. 1980 27 p refs
(Contract NAS1-15395)
(NASA-CR-3242) Avail: NTIS HC A03/MF A01 CSCL 21E

Diagnostic 2 - 5 mm infrared spectra of a hydrogen burning scramjet exhaust were measured with an interferometer spectrometer. Exhaust gas temperatures and water vapor partial pressures were determined from the observed intensity and spectral profile of the H2O 2.7 mm infrared emission band. Overall engine combustion efficiencies were derived by combining these measurements with the known engine operating conditions. Efficiencies fall (70 - 50 percent) as fuel equivalence ratios rise (0.4 - 1.0). Data analysis techniques and sensitivity studies are also presented. Author

N80-16059# National Bureau of Standards, Boulder, Colo. Thermophysical Properties Div.
TITANIUM COMBUSTION IN TURBINE ENGINES Final Report
Thomas R. Strobridge, John C. Moulder, and Alan F. Clark Washington DOT Jul. 1979 131 p refs
(Contract DOT-FA78WAI-831)
(AD-A075657; NBSIR-79-1616; FAA-RD-79-51) Avail: NTIS HC A07/MF A01 CSCL 11/6

Pure and alloyed titanium components are routinely used in aircraft turbine engines because of their uniquely high strength-to-weight ratios among structural metals, combined with excellent fatigue and corrosion resistance. Like most other metals, titanium is combustile under certain conditions of temperature, pressure and oxygen concentration and in fact there have been several instances of titanium combustion in service engines. Contemporary titanium use in aircraft turbine engines and the limits of that use are explored. Combustivn incidents and their causes are discussed as well as the typical extent of damage. Current preventative measures are outlined. For better understanding, the fundamentals of metal combustion and the experimental research related to titanium combustion are thoroughly treated and analytical combustion models are presented. Finally, the relevant experimental combustion data are correlated as a function of static temperature and Reynolds number and compared to the model predictions. Author

N80-16060*# Massachusetts Inst. of Tech., Cambridge.
AIR POLLUTION FROM AIRCRAFT
John B. Heywood, James A. Fay, and Norman A. Chigier (Sheffield Univ.) Oct. 1979 47 p refs
(Grant NGR-22-009-378)
(NASA-CR-159712) Avail: NTIS HC A03/MF A01 CSCL 21E

A series of fundamental problems related to jet engine air pollution and combustion were examined. These include soot formation and oxidation, nitric oxide and carbon monoxide emissions mechanisms, pollutant dispersion, flow and combustion characteristics of the NASA swirl can combustor, fuel atomization and fuel-air mixing processes, fuel spray drop velocity and size measurement, ignition and blowout. A summary of this work, and a bibliography of 41 theses and publications which describe this work, with abstracts, is included. A.R.H.

N80-16061*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
CORE NOISE INVESTIGATION OF THE CF6-50 TURBOFAN ENGINE Data Report, 1978 - 1979
V. L. Doyle Jan. 1980 357 p
(Contract NAS3-21260)
(NASA-CR-159598; R79AEG247) Avail: NTIS HC A16/MF A01 CSCL 21E

Acoustic data obtained during the running of the CF6-50 turbofan engine on an outdoor test stand are presented. The test was conducted to acquire simultaneous internal and far-field measurements to determine the influence of internally generated noise on the far-field measurements. The data includes internal and far-field narrowband and one-third octave band pressure spectra. R.E.S.

N80-16062*# General Electric Co., Cincinnati, Ohio. Aircraft Engine Group.
CORE NOISE INVESTIGATION OF THE CF6-50 TURBOFAN ENGINE Final Report
V. L. Doyle and M. T. Moore Jan. 1980 520 p refs
(Contract NAS3-21260)
(NASA-CR-159749; R79AEG395) Avail: NTIS HC A22/MF A01 CSCL 21E

The contribution of the standard production annular combustor to the far-field noise signature of the CF6-50 engine was investigated. Internal source locations were studied. Transfer functions were determined for selected pairs of combustor sensors and from two internal sensors to the air field. The coherent output power was determined in the far-field measurements, and comparisons of measured overall power level were made with component and engine correlating parameters. R.E.S.

N80-16063*# Pratt and Whitney Aircraft Group, East Hartford, Conn.
EXPANDED STUDY OF FEASIBILITY OF MEASURING IN-FLIGHT 747/JT9D LOADS, PERFORMANCE, CLEAR-

ANCE, AND THERMAL DATA
G. P. Sallee and R. L. Martin (Boeing Commercial Airplane Co., Seattle, Wash.) 4 Feb. 1980 107 p
(Contract NAS3-20632)
(NASA-CR-159717; PWA-5512-46) Avail: NTIS HC A06/MF A01 CSCL 21E

The JT9D jet engine exhibits a TSFC loss of about 1 percent in the initial 50 flight cycles of a new engine. These early losses are caused by seal-wear induced opening of running clearances in the engine gas path. The causes of this seal wear have been identified as flight induced loads which deflect the engine cases and rotors, causing the rotating blades to rub against the seal surfaces, producing permanent clearance changes. The real level of flight loads encountered during airplane acceptance testing and revenue service and the engine's response in the dynamic flight environment were investigated. The feasibility of direct measurement of these flight loads and their effects by concurrent measurement of 747/JT9D propulsion system aerodynamic and inertia loads and the critical engine clearance and performance changes during 747 flight and ground operations was evaluated. A number of technical options were examined in relation to the total estimated program cost to facilitate selection of the most cost effective option. It is concluded that a flight test program meeting the overall objective of determining the levels of aerodynamic and inertia load levels to which the engine is exposed during the initial flight acceptance test and normal flight maneuvers is feasible and desirable. A specific recommended flight test program, based on the evaluation of cost effectiveness, is defined. A.R.H.

N80-16064# Stevens Inst. of Tech., Hoboken, N. J. Dept. of Mechanical Engineering.
RESEARCH ON THE FLUTTER OF AXIAL TURBOMACHINE BLADING
Fernando Sisto and Mark Ward Sep. 1979 41 p refs
(Contract N00014-76-C-0540; NR Proj. 094-363)
(AD-A074597; ME-RT-79004) Avail: NTIS HC A03/MF A01 CSCL 20/4

Typical aerodynamic moment and free flutter measurements are presented for negative stagger of thin airfoils in an annular cascade. The parameters of interest for the free flutter measurements are incidence angle, torsional amplitude, and reduced frequency (reduced velocity). For moment measurements, the significant parameters are mean incidence angle, interblade phase angle, and amplitude of oscillation. Since measurements take the form of a continuous record of moment versus angular position, the symbolic name 'moment loops' is used. The characteristics of the experimental data are discussed and comparison is made with earlier test data for positive stagger angle with the same airfoil. GRA

N80-16219*# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
DESIGN OF TURBINE BLADES FOR EFFECTIVE SLIP DAMPING AT HIGH ROTATIONAL SPEEDS
David I. G. Jones and Agnieszka Muszynska (Polish Acad. Sci.) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 87-96 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 21E

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N80-16065*# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
DIGITAL ADAPTIVE CONTROLLERS FOR VTOL VEHICLES. VOLUME 1: CONCEPT EVALUATION Final Report
G. L. Hartmann, Gunter Stein, and Stephen G. Pratt Nov. 1979 196 p refs 2 Vol.
(Contract NAS1-14921)
(NASA-CR-159154-Vol-1; HONEYWELL-2825-41592-Vol-1) Avail: NTIS HC A09/MF A01 CSCL 01C

A digital self-adaptive flight control system was developed for flight test in the VTOL approach and landing technology (VALT) research aircraft (a modified CH-47 helicopter). The control laws accept commands from an automatic on-board guidance system. The primary objective of the control laws is to provide good command-following with a minimum cross-axis response. Three attitudes and vertical velocity are separately commanded. Adaptation of the control laws is based on information from rate and attitude gyros and a vertical velocity measurement. The final design resulted from a comparison of two different adaptive concepts--one based on explicit parameter estimates from a real-time maximum-likelihood estimation algorithm, the other based on an implicit model reference adaptive system. The two designs were compared on the basis of performance and complexity. A.R.H.

N80-16066*# Honeywell, Inc., Minneapolis, Minn.
DIGITAL ADAPTIVE CONTROLLERS FOR VTOL VEHICLES. VOLUME 2: SOFTWARE DOCUMENTATION Final Report
G. L. Hartman, Gunter Stein, and Stephen G. Pratt Nov. 1979 90 p 2 Vol.
(Contract NAS1-14921)
(NASA-CR-159154-Vol-2; HONEYWELL-2825-41592-Vol-2) Avail: NTIS HC A05/MF A01 CSCL 01C

The VTOL approach and landing test (VALT) adaptive software is documented. Two self-adaptive algorithms, one based on an implicit model reference design and the other on an explicit parameter estimation technique were evaluated. The organization of the software, user options, and a nominal set of input data are presented along with a flow chart and program listing of each algorithm. A.R.H.

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N80-16067# Braslau (David) Associates, Inc., Minneapolis, Minn.
GROUND RUN-UP NOISE CONTROL FACILITIES FOR CIVIL AIRCRAFT: A SURVEY
David Braslau 30 Jan. 1979 123 p
(Contract W1-78-5339-1)
(AD-A075348; FAA-RD-79-17; ARD-410) Avail: NTIS HC A06/MF A01 CSCL 01/4

This survey of existing ground run-up suppressors and barriers for civil aircraft includes a review of acoustical, aerodynamic, and mechanical effects associated with facilities in the United States, Europe, and Japan. Evaluations were made of each suppressor based upon published and unpublished reports, and supplemented where necessary by direct questionnaires to the operators, designers, and users of the facilities. Acoustical data where available was compiled for near and far field points at all directions from aircraft heading. Aerodynamic and mechanical effects on airframe and engine performance during run-up have been identified in terms of exhaust gas reingestion, engine or airframe damage, or restrictions on facility operation. The potential for standards development is discussed with respect to available information with recommendations for additional studies needed before such standards could be promulgated. M.M.M.

N80-16068*# Washington Univ., Seattle.
RECENT RESEARCH ON V/STOL TEST LIMITS AT THE UNIVERSITY OF WASHINGTON AERONAUTICAL LABORATORY Final Report
Shojiro Shindo and William H. Rae, Jr. Feb. 1980 27 p refs
(Grant NGL-48-002-035)
(NASA-CR-3237) Avail: NTIS HC A03/MF A01 CSCL 14B

The occurence of flow breakdown during the wind tunnel testing of a powered V/STOL aircraft was studied. Flow breakdown is the low forward speed test limit in a solid wall wind tunnel

and is characterized by a vortex which forms on the floor and walls of the wind tunnel thereby failing to simulate free air conditions. The flow is caused by the interaction of the model wake and tunnel boundary layer and affects the model's aerodynamic characteristics in such fashion as to negate their reliability as correctable wind tunnel data. The low speed test limit was examined using a model that possessed a discretely concentrated powered lift system using a pair of lift jets. The system design is discussed and the tests and results which show that flow breakdown occurs at a velocity ratio of approximately 0.20 are reported. A.W.H.

N80-16069# BDM Corp., McLean, Va. Systems Research and Development Service.
INFRARED RUNWAY COLLISION AVOIDANCE SYSTEM ANALYSIS Final Report, Sep. 1978 - Mar. 1979
P. E. Powell and G. H. Greenleaf Apr. 1979 87 p refs
(Contract DOT-FA78WA-4196)
(AD-A078131; FAA-RD-79-32; BDM/W-79-099-TR) Avail: NTIS HC A05/MF A01 CSCL 01/5

The applicability and effectiveness of active and passive infrared devices for use in runway collision avoidance systems during low visibility airport operations are addressed. Emphasis is placed on the optical attenuation caused by conditions of fog and haze as a function of detector system wavelength. Two feasible approaches to the use of infrared techniques in runway collision avoidance systems are presented. The recommended approach involves the use of a runway-mounted active CO2 laser system which provides an unambiguous indication of aircraft on the runway. The CO2 laser application has several desirable characteristics which include required all weather conditions. The alternative approach involves the use of a runway-mounted two-color passive IR system for jet engine heat detection. The two-color system is feasible but falls short of providing satisfactory detection range in fog without excessive hardware deployment. The recommended approach to development of a system specification which would include experimental tests and design of a prototype system is discussed. J.M.S.

N80-16070*# Franklin Inst. Research Labs., Philadelphia, Pa.
FEASIBILITY AND CONCEPT STUDY TO CONVERT THE NASA/AMES VERTICAL MOTION SIMULATOR TO A HELICOPTER SIMULATOR Final Report
C. A. Belsterling, R. C. Chou, E. G. Davies, and K. C. Tsui Sep. 1978 150 p
(Contract NAS2-9884; NASA Order C-4952-1)
(NASA-CR-152193) Avail: NTIS HC A07/MF A01 CSCL 14B

The conceptual design for converting the vertical motion simulator (VMS) to a multi-purpose aircraft and helicopter simulator is presented. A unique, high performance four degrees of freedom (DOF) motion system was developed to permanently replace the present six DOF synergistic system. The new four DOF system has the following outstanding features: (1) will integrate with the two large VMS translational modes and their associated subsystems; (2) can be converted from helicopter to fixed-wing aircraft simulation through software changes only; (3) interfaces with an advanced cab/visual display system of large dimensions; (4) makes maximum use of proven techniques, convenient materials and off-the-shelf components; (5) will operate within the existing building envelope without modifications; (6) can be built within the specified weight limit and avoid compromising VMS performance; (7) provides maximum performance with a minimum of power consumption; (8) simple design minimizes coupling between motions and maximizes reliability; and (9) can be built within existing budgetary figures. R.E.S.

N80-16071*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
DESIGN CONSIDERATIONS FOR ATTAINING 200-KNOT TEST VELOCITIES AT THE AIRCRAFT LANDING LOADS AND TRACTION FACILITY
Gary L. Giles and Sandy M. Stubbs May 1979 75 p refs
(NASA-TM-80096) Avail: NTIS HC A04/MF A01 CSCL 14B

Design studies are presented which consider the important parameters in providing 200 knot test velocities at the landing loads and traction facility. Two major components of this facility, the hydraulic jet catapult and the test carriage structure, are considered. Suitable factors are determined to correlate analytical data for characteristics of the hydraulic jet catapult with data measured from the existing catapult system. The resulting equations are used to calculate test velocities for a range of jet nozzle diameters and carriage masses with both the current 122 m and an increased 183 m catapult stroke. Using the catapult characteristics, a target design point is selected and a carriage structure is sized to meet the target point strength requirements. A.W.H.

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

N80-16072*# National Aeronautics and Space Administration, Washington, D. C.
MISSION OPERATION REPORT. SOLAR MAXIMUM MISSION (SMM)
11 Feb. 1980 35 p
(NASA-TM-80939; S-626-80-01) Avail: NTIS HC A03/MF A01 CSCL 22A

Contents: (1) scientific background; (2) mission description; (3) mission objectives; (4) observatory description; (5) experiment descriptions; (6) launch vehicle description; (7) mission support; (8) project management; and (9) SMM project costs. M.M.M.

N80-16073*# McDonnell-Douglas Technical Services Co., Inc., Houston, Tex.
SOLAR MAXIMUM MISSION PANEL JETTISON ANALYSIS REMOTE MANIPULATOR SYSTEM Final Report
R. B. Bauer Houston, Tex. NASA. Johnson Space Center Jan. 1980 88 p refs
(NASA-CR-162466; JSC-16333; Rept-80-FM-6) Avail: NTIS HC A05/MF A01 CSCL 22A

A study is presented of the development of the Remote Manipulator System (RMS) configurations for jettison of the solar panels on the Solar Maximum Mission/Multimission Satellite. A valid RMS maneuver between jettison configurations was developed. Arm and longeron loads and effector excursions due to the solar panel jettison were determined to see if they were within acceptable limits. These loads and end effector excursions were analyzed under two RMS modes, servos active in position hold submode, and in the brakes on mode. M.M.M.

N80-16074# New Mexico Univ., Albuquerque. Technology Application Center.
MANUFACTURING IN SPACE. CITATIONS FROM THE INTERNATIONAL AEROSPACE ABSTRACTS DATA BASE Progress Report, 1976 - Oct. 1979
Gerald F. Zollars Oct. 1979 86 p Sponsored by NTIS
(NTIS/PS-79/1053/2) Avail: NTIS HC $28.00/MF $28.00 CSCL 13H

Articles from worldwide literature concerning manufacturing in space are presented. The effects of weightlessness on a variety of manufacturing processes such as crystal growth, welding, zone melting, casting, and the construction of structures are highlighted. Articles concerning materials science research in the European Spacelab program are included. Three hundred and thirty three citations are included. GRA

N80-16075# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE, NO. 1
20 Dec. 1979 59 p Transl. into ENGLISH from various Russian journals
(JPRS-74805) Avail: NTIS HC A04/MF A01

Reports are presented on Soviet space exploration, including all aspects of the manned space program, space science, interplanetary research, space engineering, space research applications (communications, satellite geodesy, space meteorology, remote sensing), and space policy and administration. For individual titles, see N80-16076 through N80-16078.

N80-16076# Joint Publications Research Service, Arlington, Va.
INTERNATIONAL INVESTIGATION OF THE MAGNETOSPHERE c46
V. V. Migulin and B. I. Silkin *In its* USSR Rept.: Space, No. 1 (JPRS-74805) 20 Dec. 1979 p 3-14 refs Transl. into ENGLISH from Priroda (USSR) no. 6, 1979 p 2-8 (For primary document see N80-16075 07-12)
Avail: NTIS HC A04/MF A01

Topics covered in these investigations of the magnetosphere include: study of regions of abrupt turning of the direction of the magnetic field; investigation of convection of magnetospheric plasma; interaction of waves with particles; wave propagation through magnetic field nonuniformities; large scale instability of plasma; and instabilities associated with electric currents in circumterrestrial space. M.M.M.

N80-16077# Joint Publications Research Service, Arlington, Va.
SPACE VEHICLE APPROACH PROCEDURES DESCRIBED c18
B. Pokrovskiy *In its* USSR Rept.: Space No. 1 (JPRS-74805) 20 Dec. 1979 p 28-37 Transl. into ENGLISH from Aviats. Kosmon. (USSR), no. 8, 1979 p 36-37 (For primary document see N80-16075 07-12)
Avail: NTIS HC A04/MF A01

The approach of the Soyuz spacecraft to the Salyut space station is described. This process is divided into two parts: distant and close. During the first stage, the ship is placed into the station orbit in the effective zone of the on-board 'Igla' automatic system. During the second stage, the spacecraft is placed into the mooring stage and docking is accomplished. M.M.M.

N80-16078# Joint Publications Research Service, Arlington, Va.
TELEMETRY FROM ORBIT c17
L. Labutin *In its* USSR Rept.: Space, No. 1 (JPRS-74805) 20 Dec. 1979 p 38-44 Transl. into ENGLISH from Radio (Moscow), no. 3, 1979 p 18-19 (For primary document see N80-16075 07-12)
Avail: NTIS HC A04/MF A01

The principles for constructing the telemetric system are discussed in order to encourage new detachments of radio enthusiasts to participate in space experiments. M.M.M.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N80-16079 Stanford Univ., Calif.
ORBITS NEAR CRITICAL INCLINATION, INCLUDING LUNISOLAR PERTURBATIONS Ph.D. Thesis
Michael Ernest Hough 1979 409 p
Avail: Univ. Microfilms Order No. 8001938

An improved theory is developed of long period perigee motion for near-Earth orbits (semimajor axes less than 6 Earth radii) near the critical inclinations 63.4 deg and 116.6 deg. The inclusion of lunisolar perturbations and all known zonal harmonic coefficients in the geopotential are significant improvements over existing theories. Hamiltonian terms up to and including degree four in eccentricity are modeled. Two different Earth models are compared. Atmospheric drag is not modeled because the orbits analyzed have perigee altitudes above 700 km. The theory is applicable in the orbit determination and long term orbit prediction of such critical inclination satellites as GPS (Global Positioning System) which, due to their high altitudes (20,000 km), are significantly perturbed by the Sun and Moon. Very slow fluctuations (100 year periods) in the perigee location and altitude are predicted near the critical inclinations because there is no average change in perigee location due to oblateness.
Dissert. Abstr.

N80-16080*# Michigan Univ., Ann Arbor.
OPTIMUM REENTRY TRAJECTORIES OF A LIFTING VEHICLE Final Report
Jeng-Shing Chern and Nguyen Xuan Vinh Feb. 1980 121 p refs
(Grant NsG-1448)
(NASA-CR-3236) Avail: NTIS HC A06/MF A01 CSCL 22A

Research results are presented of an investigation of the optimum maneuvers of advanced shuttle type spacecraft during reentry. The equations are formulated by means of modified Chapman variables resulting in a general set of equations for flight analysis which are exact for reentry and for flight in a vacuum. Four planar flight typical optimum manuevers are investigated. For three-dimensional flight the optimum trajectory for maximum cross range is discussed in detail. Techniques for calculating reentry footprints are presented. Author

N80-16081*# National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.
EVALUATION OF USE OF MPAD TRAJECTORY TAPE AND NUMBER OF ORBIT POINTS FOR ORBITER MISSION THERMAL PREDICTIONS
Robert A. Vogt Nov. 1979 126 p refs
(NASA-TM-80946; JSC-16303) Avail: NTIS HC A06/MF A01 CSCL 22A

The application of using the mission planning and analysis division (MPAD) common format trajectory data tape to predict temperatures for preflight and post flight mission analysis is presented and evaluated. All of the analyses utilized the latest Space Transportation System 1 flight (STS-1) MPAD trajectory tape, and the simplified '136 note' midsection/payload bay thermal math model. For the first 6.7 hours of the STS-1 flight profile, transient temperatures are presented for selected nodal locations with the current standard method, and the trajectory tape method. Whether the differences are considered significant or not depends upon the view point. Other transient temperature predictions are also presented. These results were obtained to investigate an initial concern that perhaps the predicted temperature differences between the two methods would not only be caused by the inaccuracies of the current method's assumed nominal attitude profile but also be affected by a lack of a sufficient number of orbit points in the current method. Comparison between 6, 12, and 24 orbit point parameters showed a surprising insensitivity to the number of orbit points. R.E.S.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N80-16082*# Grumman Aircraft Engineering Corp., Bethpage, N. Y. Research Dept.
CONTROL OF LARGE SPACE STRUCTURES Final Report
R. Gran, M. Rossi, H. G. Moyer, and F. Austin Apr. 1979 134 p refs
(Contract NAS8-32587)
(NASA-CR-161369; RE-589) Avail: NTIS HC A07/MF A01 CSCL 22B

The control of large space structures was studied to determine what, if any, limitations are imposed on the size of spacecraft which may be controlled using current control system design technology. Using a typical structure in the 35 to 70 meter size category, a control system design that used actuators that are currently available was designed. The amount of control power required to maintain the vehicle in a stabilized gravity gradient pointing orientation that also damped various structural motions was determined. The moment of inertia and mass properties of this structure were varied to verify that stability and performance were maintained. The study concludes that the structure's size is required to change by at least a factor of two before any stability problems arise. The stability margin that is lost is due to the scaling of the gravity gradient torques (the rigid body control) and as such can easily be corrected by changing the control gains associated with the rigid body control. A secondary

conclusion from the study is that the control design that accommodates the structural motions (to damp them) is a little more sensitive than the design that works on attitude control of the rigid body only. R.E.S.

N80-16083*# Howard Univ., Washington, D. C. School of Engineering.
STUDY OF FOLDABLE ELASTIC TUBES FOR LARGE SPACE STRUCTURE APPLICATIONS, PHASE 1 Final Report
Irving W. Jones, Collins Boateng, and Caster D. Williams Jan. 1980 58 p refs
(Grant NsG-1320)
(NASA-CR-162652) Avail: NTIS HC A04/MF A01 CSCL 22B

Structural members that might be suitable for strain energy deployable structures, are discussed with emphasis on a thin-walled cylindrical tube with a cross-section that is called 'bi-convex'. The design of bi-convex tube test specimens and their fabrication are described as well as the design and construction of a special purpose testing machine to determine the deployment characteristics. The results of the first series of tests were quite mixed, but clearly revealed that since most of the specimens failed to deploy completely, due to a buckling problem, this type of tube requires some modification in order to be viable. A.R.H.

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N80-16084*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SATELLITE TIME TRANSFER VIA TRACKING AND DATA RELAY SATELLITE SYSTEM (TDRSS) AND APPLICATIONS
Andrew R. Chi Dec. 1979 23 p refs Presented at the 11th Ann. Precise Time and Time Interval Applications and Planning Meeting, Greenbelt, Md., 27-29 Nov. 1979
(NASA-TM-80805) Avail: NTIS HC A02/MF A01 CSCL 22A

With two geosynchronous relay satellites the tracking and data relay satellite system (TDRSS) can provide nearly worldwide coverage for communication between all near orbiting satellites and the satellite control center at Goddard Space Flight Center. Each future NASA satellite will carry a TDRSS transponder with which the satellite can communicate through a TDRSS to the ground station at White Sands, New Mexico. It is using this system that the ground station master clock time signal can be transmitted to the near Earth orbiting satellite in which a clock may be maintained independently to the accuracy required by the experimenters. The satellite time transfer terminal design concept and the application of the time signal in autonomously operated spacecraft clock are discussed. Some pertinent TDRSS parameters and corrections for the propagation delay measurement as well as the time code used to transfer the time signal are given. A.R.H.

N80-16085# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
DYNAMIC ANALYSIS OF BEAM-RIDER MISSILE PERFORMANCE
J. Shinar, E. Besner, and Y. Rotsztein Aug. 1979 29 p refs
(TAE-376) Avail: NTIS HC A03/MF A01

Performance of a point defense beam rider missile system with linearized trajectory equations is analyzed taking into account the dynamics of the guidance loop. It is shown that adding a lead term, proportional to the line of sight turn rate, to the guidance command improves the system performance against maneuvering targets at the expense of increased noise sensitivity. A formal solution to the problem of optimal avoidance of beam rider missiles is also presented indicating a 'bang-bang' type evasive maneuver. Author

N80-16086*# Boeing Aerospace Co., Seattle, Wash.
SOLAR POWER SATELLITE SYSTEM DEFINITION STUDY, PHASE 2. VOLUME 2: REFERENCE SYSTEM DESCRIPTION
Nov. 1979 464 p 5 Vol.
(Contract NAS9-15636)
(NASA-CR-160443; D180-25461-2) Avail: NTIS HC A20/MF A01 CSCL 22B

System descriptions and cost estimates for the reference system of the solar power satellite program are presented. The reference system is divided into five principal elements: the solar power satellites; space construction and support; space and ground transportation; ground receiving stations; and operations control. The program scenario and non-recurring costs are briefly described. R.E.S.

N80-16087# National Environmental Satellite Service, Washington, D. C. Office of System Engineering.
GEOSTATIONARY OPERATIONAL ENVIRONMENTAL SATELLITE/DATA COLLECTION SYSTEM
Jul. 1979 89 p refs
(PB-301276/2; NOAA-TR-NESS-78; NOAA-79090701) Avail: NTIS HC A05/MF A01 CSCL 22A

A description to potential users of the carrier system and its data processing capabilities are given. User qualifications and requirements for participation in the Data Collection System are also defined. GRA

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N80-16088# Committee on Science and Technology (U. S. House).
SPACE SHUTTLE OPERATIONAL PLANNING, POLICY AND LEGAL ISSUES
Washington GPO 1979 272 p refs Hearings before the Subcomm. on Space Sci. and Applications of the Comm. on Sci. and Technol., 96th Congr., 1st Sess., 25-26 Sep. 1979
(GPO-53-649) Avail: Subcomm. on Space Sci. and Applications

Government policies and agencies; regulations; user charges; provisions for launch assurance and priorities; user liabilities insurance and indemnity provisions; protection of individual and private property, as well as patents and proprietary rights involve questions of legal and business importance which can have a significant effect on the extent to which the space transportation system will promote private venture. Approaches to the organizatiovn and management of an operational space transportation system in the 1980's are examined. A.R.H.

N80-16089*# Remtech, Inc., Huntsville, Ala.
SPACE SHUTTLE BASE HEATING ANALYSIS Final Report
11 Jan. 1980 16 p refs
(Contract NAS8-29270)
(NASA-CR-161375; RTR-014-10) Avail: NTIS HC A02/MF A01 CSCL 22B

Work performed in support of radiation and convective base heating predictions in developing the space shuttle thermal environment is described. Topics discussed include plume radiation predictions and the development of prediction methods; convective base heating predictions due to both reversed flow and direct plume impingement; and evaluation testing of a gas temperature probe used in short-duration base heating model tests. A.R.H.

N80-16199*# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
THE DEVELOPMENT OF A METHOD FOR PREDICTING THE NOISE EXPOSURE OF PAYLOADS IN THE SPACE SHUTTLE ORBITER VEHICLE
John F. Wilby and Larry D. Pope *In* Shock and Vibration Inform.

Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 5-30 refs Sponsored by NASA, Washington and SAUSO (For primary document see N80-16198 07-31)
(Contracts NAS5-22832; NAS9-15231)
Avail: NTIS HC A09/MF A01 CSCL 20A

N80-16203*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE SHUTTLE SOLID ROCKET BOOSTER AFT SKIRT REENTRY NOISE INDUCED BY AN AERODYNAMIC CAVITY-FLOW INTERACTION
L. A. Schutzenhofer, P. W. Howard, W. W. Clever, and S. H. Guest *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 67-82 refs (For primary document see N80-16198 07-31)
Avail: NTIS HC A09/MF A01 CSCL 20A

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N80-16090*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A GROUPED BINARY TIME CODE FOR TELEMETRY AND SPACE APPLICATIONS
Andrew R. Chi Dec. 1979 25 p refs Presented at Intern. Telemetering Conf., San Diego, Calif., 19-21 Nov. 1979
(NASA-TM-80606) Avail: NTIS HC A02/MF A01 CSCL 09F

A computer oriented time code designed for users with various time resolution requirements is presented. It is intended as a time code for spacecraft and ground applications where direct code compatibility with automatic data processing equipment is of primary consideration. The principal features of this time code are: byte oriented format, selectable resolution options (from seconds to nanoseconds); and long ambiguity period. The time code is compatible with the new data handling and management concepts such as the NASA End-to-End Data System and the Telemetry Data Packetization format. M.M.M.

N80-16078# Joint Publications Research Service, Arlington, Va.
TELEMETRY FROM ORBIT
L. Labutin *In its* USSR Rept.: Space, No. 1 (JPRS-74805) 20 Dec. 1979 p 38-44 Transl. into ENGLISH from Radio (Moscow), no. 3, 1979 p 18-19 (For primary document see N80-16075 07-12)
Avail: NTIS HC A04/MF A01

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N80-16091*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ORBITER LANDING LOADS MATH MODEL DESCRIPTION AND CORRELATION WITH ALT FLIGHT DATA
David A. Hamilton, John A. Schliesing, and George A. Zupp, Jr. Washington Jan. 1980 27 p refs
(NASA-RP-1056; JSC-16202; S-498) Avail: NTIS HC A03/MF A01 CSCL 22B

Results of the space shuttle approach and landing test are examined in order to assess landing gear characteristics and performance and verify landing dynamic analyses. The landing gears were instrumented with load-calibrated strain gages, a wheel-speed sensor, and strut stroke measurement devices. The mathematical procedure used in predicting the shuttle touchdown loads and dynamics is presented together with the comparisons between measured flight data and the analytical predictions. Conclusions from these data are also presented. J.M.S.

N80-16092*# Columbia Univ., New York. School of Engineering and Applied Science.
RESEARCH STUDY: SPACE VEHICLE CONTROL SYSTEMS Final Report
Peter W. Likins and Richard W. Longman Nov. 1979 247 p refs
(Contract NASB-32212)
(NASA-CR-161368) Avail: NTIS HC A11/MF A01 CSCL 22B

From the control point of view, spacecraft are classified into two main groups: those for which the spacecraft is fully defined before the control system is designed; and those for which the control system must be specified before certain interchangeable parts of a multi-purpose spacecraft are selected for future missions. Consideration is given to both classes of problems. M.M.M.

N80-16093*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF SECONDARY YIELD PARAMETER VARIATION ON PREDICTED EQUILIBRIUM POTENTIAL OF AN OBJECT IN A CHARGING ENVIRONMENT
Carolyn K. Purvis 1979 21 p refs Presented at the Ann. Conf. on Nucl. and Space Radiation Effects, Santa Cruz, Calif., 16-20 Jul. 1979; sponsored by IEEE
(NASA-TM-79299; E-117) Avail: NTIS HC A02/MF A01 CSCL 22B

The sensitivity of predicted equilibrium potential to changes in secondary electron yield parameters was investigated using MATCHG, a simple charging code which incorporates the NASCAP material property formulations. The equilibrium potential was found to be a sensitive function of one of the two parameters specifying secondary electron yield due to proton impact and of essentially all the parameters specifying yield due to electron impact. The information on the electron generated secondary yield parameters was discovered to be obtainable from monoenergetic beam charging data if charging rates as well as equilibrium potentials are accurately recorded. A.W.H.

N80-16094*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMPUTED VOLTAGE DISTRIBUTIONS AROUND SOLAR ELECTRIC PROPULSION SPACECRAFT
N. John Stevens 1979 20 p refs Presented at 14th Intern. Conf. on Elec. Propulsion, Princeton, N.J., 30 Oct. - 1 Nov. 1979; sponsored by AIAA and DGLR
(NASA-TM-79286; E-225) Avail: NTIS HC A02/MF A01 CSCL 22B

The NASA Charging Analyzer Program is used to conduct preliminary computations of the voltage distributions around such large spacecraft in geomagnetic substorm environments at geosynchronous altitudes. Both a standard operating voltage (+ or - 150 volts on solar arrays) and direct-drive (+1200 volts on arrays) configurations are considered. Thruster-off simulations are computed for both operating voltage configurations while the effect of simulated thruster-on conditions are evaluated only for direct-drive configuration. These simulated thruster-on conditions are evaluated only for direct-drive configuration. These simulated thruster operations appear to alleviate surface charging. M.M.M.

N80-16077# Joint Publications Research Service, Arlington, Va.
SPACE VEHICLE APPROACH PROCEDURES DESCRIBED
B. Pokrovskiy *In its* USSR Rept.: Space No. 1 (JPRS-74805) 20 Dec. 1979 p 28-37 Transl. into ENGLISH from Aviats. Kosmon. (USSR), no. 8, 1979 p 36-37 (For primary document

see N80-16075 07-12)
Avail: NTIS HC A04/MF A01

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion*, *28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N80-16095*# National Aeronautics and Space Administration. *Goddard Space Flight Center, Greenbelt, Md.*
SEALED-CELL NICKEL-CADMIUM BATTERY APPLICATIONS MANUAL
Willard R. Scott and Douglas W. Rusta Dec. 1979 533 p refs
(NASA-RP-1052) Avail: NTIS HC A23/MF A01 CSCL 10B

The design, procurement, testing, and application of aerospace quality, hermetically sealed nickel-cadmium cells and batteries are presented. Cell technology, cell and battery development, and spacecraft applications are emphasized. Long term performance is discussed in terms of the effect of initial design, process, and application variables. Design guidelines and practices are given. M.G.

N80-16096*# *Boeing Aerospace Co., Seattle, Wash.*
ELECTRIC PROPULSION FOR NEAR-EARTH SPACE MISSIONS Final Report, Feb. 1978 - Apr. 1979
C. H. Terwilliger and W. W. Smith Jan. 1980 206 p
(Contract NAS3-21346)
(NASA-CR-159735; D180-25475-1) Avail: NTIS HC A10/MF A01 CSCL 21C

A set of missions was postulated that was considered to be representative of those likely to be desirable/feasible over the next three decades. The characteristics of these missions, and their payloads, that most impact the choice/design of the requisite propulsion system were determined. A system-level model of the near-Earth transportation process was constructed, which incorporated these mission/system characteristics, as well as the fundamental parameters describing the technology/performance of an ion bombardment based electric propulsion system. The model was used for sensitivity studies to determine the interactions between the technology descriptors and program costs, and to establish the most cost-effective directions for technology advancement. The most important factor was seen to be the costs associated with the duration of the mission, and this in turn makes the development of advanced electric propulsion systems having moderate to high efficiencies (> 50 percent) at intermediate ranges of specific impulse (approximately 1000 seconds) very desirable. Author

N80-16097*# *National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.*
UPPER STAGES UTILIZING ELECTRIC PROPULSION
David C. Byers 1980 21 p refs Presented at the JANNAF Propulsion Meeting, Monterey, Calif., 11-13 Mar. 1980
(NASA-TM-81412; E-330) Avail: NTIS HC A02/MF A01 CSCL 21C

The payload characteristics of geocentric missions which utilize electron bombardment ion thruster systems are discussed. A baseline LEO to GEO orbit transfer mission was selected to describe the payload capabilities. The impacts on payloads of both mission parameters and electric propulsion technology options were evaluated. The characteristics of the electric propulsion thrust system and the power requirements were specified in order to predict payload mass. This was completed by utilizing a previously developed methodology which provides a detailed thrust system description after the final mass on orbit, the thrusting time, and the specific impulse are specified. The impact on payloads of total mass in LEO, thrusting time, propellant type, specific impulse, and power source characteristics was evaluated. A.W.H.

N80-16098# Tennessee Univ. Space Inst., Tullahoma.
PARTICLE SIZE MEASUREMENTS IN SOLID PROPELLANT ROCKET EXHAUST PLUMES Final Report, 11 Jul. 1977 - 30 Jun. 1978
Kenneth E. Harwell and W. Michael Farmer 30 Jun. 1978 47 p
(Contract N00174-77-C-0234)
(AD-A073556) Avail: NTIS HC A03/MF A01 CSCL 21/9

Particle sizing interferometer measurement of particle size distributions, velocity and number density in samples of rocket propellant exhaust is described. Signal visibility and scattered intensity for individual particles were measured for a nominal size range of 0.3 to 6 micrometers. Calibration tests of the instrument were obtained by firing small propellant samples into a 20 cu cm chamber and comparing the measured particle size distributions with those obtained from estimates using multiple wavelength transmissometers and a commercial optical particle counter. Particle sizing interferometer estimates of particle size distributions and number densities required the development of models which could account for sample space dependence on particle size and illuminating fringe contrast variation. Results obtained by using these models on particle size data from calibration and rocket motor test firings show the need for well-controlled insitu perturbationless particle size measuring techniques for hostile environments. GRA

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N80-16099# Rockwell International Corp., Richland, Wash. Hanford Operations.
DETERMINATION OF WATER SOLUBILITY IN ORGANIC LIQUIDS
C. H. Hunter and C. B. Honaker Jun. 1979 10 p refs Presented at 34th Northwest Regional Meeting of the Am. Chem. Soc., *Richland, Wash., 13 Jun. 1979*
(Contract EY-77-C-06-1030)
(RHO-SA-113; CONF-790666-5) Avail: NTIS HC A02/MF A01

It is necessary to determine the solubility of water in organic liquids such as cyclohexanone, when the amount of dissolved water would affect the extractive power of the organic liquid. Methods previously used to determine the solubility of water in organic liquids include titration, gas chromatography and refractive index measurements. Use of a tritium tracer is an easier and more accurate method. The limits of detection are lower and the dynamic range is larger. The method in this study determines the uptake of water in cyclohexanone by using a tritium tracer. Samples are spiked with tritiated water and aliquots of the organic phase are counted by liquid scintillation. The experimental procedure is described and results are discussed. DOE

24 COMPOSITE MATERIALS

Includes laminates.

N80-16100*# Jet Propulsion Lab., California Inst. of Tech., *Pasadena.*

NOVEL APPROACHES FOR ALLEVIATION OF ELECTRICAL HAZARDS OF GRAPHITE-FIBER COMPOSITES

Kumar Ramohalli 15 Oct. 1979 47 p refs

(Contract NAS7-100)

(NASA-CR-162683; JPL-Pub-79-63) Avail: NTIS HC A03/MF A01 CSCL 11D

Four basically different approaches were considered: gasification of fibers, retention in the matrix, clumping to prevent entrainment, and electrical insulation of fibers. The techniques used to achieve them are described in some detail. These involved surface treatment of fibers to improve the wettability of fibers and coating the fibers with the selected substances before laying them up for composite fabrication. Thermogravimetric analyses were performed on the plain and treated fibers in inert (nitrogen, argon) and reactive (air) atmospheres. The treated fibers embedded in epoxy were ignited in a Bunsen flame to determine the efficiency of these treatments. A simple apparatus was assembled to detect the time for the first short circuit (in a typical electrical circuit) when exposed to the combustion products from a graphite fiber composite fire. The state-of-the-art and treated fibers cast in typical epoxy were burned and ranked for potential success. It was inferred that the gasification schemes appear promising when reduction or oxidation is tried. It was also found that some very promising candidates were available for the clumping and for the electrical insulation of fibers. A.R.H.

N80-16101*# Virginia Polytechnic Inst. and State Univ., Blacksburg.

COMPOSITE MATERIALS RESEARCH AND EDUCATION PROGRAM: THE NASA-VIRGINIA TECH COMPOSITES PROGRAM Final Report

Carl T. Herakovich Feb. 1980 18 p refs

(Grant NGR-47-004-129)

(NASA-CR-162719) Avail: NTIS HC A02/MF A01 CSCL 11D

Major areas of study include: (1) edge effects in finite width laminated composites subjected to mechanical, thermal and hygroscopic loading with temperature dependent material properties and the influence of edge effects on the initiation of failure; (2) shear and compression testing of composite materials at room and elevated temperatures; (3) optical techniques for precise measurement of coefficients of thermal expansion of composites; (4) models for the nonlinear behavior of composites including material nonlinearity and damage accumulation and verification of the models under biaxial loading; (5) compressive failure of graphite/epoxy plates with circular holes and the buckling of composite cylinders under combined compression and torsion; (6) nonlinear mechanical properties of borsic/aluminum, graphite/polyimide and boron/aluminum; (7) the strength characteristics of spliced sandwich panels; and (8) curved graphite/epoxy panels subjected to internal pressure. A.R.H.

N80-16102*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FRACTURE MODES OF HIGH MODULUS GRAPHITE/EPOXY ANGLEPLIED LAMINATES SUBJECTED TO OFF-AXIS TENSILE LOADS

J. H. Sinclair 1980 22 p refs Presented at 35th Ann. Conf. of the Reinforced Plastics/Composites Inst., New Orleans, 4-8 Feb. 1980; sponsored by Soc. of Plastics Ind.

(NASA-TM-81405; E-319) Avail: NTIS HC A02/MF A01 CSCL 11D

Angleplied laminates of high modulus graphite fiber/epoxy were studied in several ply configurations at various tensile loading angles to the zero ply direction in order to determine the effects of ply orientations on tensile properties, fracture modes, and fracture surface characteristics of the various plies. It was found that fracture modes in the plies of angleplied laminates can be characterized by scanning electron microscope observation. The characteristics for a given fracture mode are similar to those for the same fracture mode in unidirectional specimens. However, no simple load angle range can be associated with a given fracture mode. Author

N80-16103*# North Carolina Agricultural and Technical State Univ., Greensboro. School of Engineering.

EFFECT OF TEMPERATURE ON COMPOSITE SANDWICH STRUCTURES SUBJECTED TO LOW VELOCITY IMPACT Final Report

Avva V. Sharma Feb. 1980 34 p refs

(Grant NsG-1296)

(NASA-CR-162718) Avail: NTIS HC A03/MF A01 CSCL 11D

The effect of low velocity projectile impact on sandwich-type structural components was investigated. The materials used in the fabrication of the impact surface were graphite-, Kevlar-, and boron-fibers with appropriate epoxy matrices. The testing of the specimens was performed at moderately low- and high-temperatures as well as at room temperature to assess the impact-initiated strength degradation of the laminates. Eleven laminates with different stacking sequences, orientations, and thicknesses were tested. The low energy projectile impact is considered to simulate the damage caused by runway debris, the dropping of the hand tools during servicing, etc., on the secondary aircraft structures fabricated with the composite materials. The results show the preload and the impact energy combinations necessary to cause catastrophic failure in the laminates tested. A set of faired curves indicating the failure thresholds is shown separately for the tension- and compression-loaded laminates. The specific-strengths and -moduli for the various laminates tested are also given. A.R.H.

N80-16104*# National Aeronautics and Space Administration, Washington, D. C.

COMPOSITE COMPONENTS UNDER IMPACT LOAD AND EFFECTS OF DEFECTS ON THE LOADING CAPACITY

R. Aoki and D. Wurzel Sep. 1979 47 p Transl. into ENGLISH of conf. paper "Composite-bauteileunter Schlagbelastung und Auswirkung von Defekten auf die Belastbarkeit", DGLR-78-190 DGLR, West Germany, 1978 48 p Presented at the DGLR Symp. Fatigue Strength of Airplanes and Mod. Construct. Tech., Darmstadt, West Germany, 22 Sep. 1978 Original language document announced as A79-20491 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3199)

(NASA-TM-75351; DGLR-78-190) Avail: NTIS HC A03/MF A01 CSCL 11D

Investigations were carried out on a horizontal tail assembly made of carbon fiber reinforced plastic for the Alpha Jet. The possibility of obtaining a leading edge nose design lighter but not more expensive than a metal version was studied. An important consideration was sufficient resistance of the leading edge against impact of stones and hailstones combined with high degree of stiffness. The improvement of energy reception characteristics of the materials through suitable laminate design was considered. Since certain defects occur in structural components, the effects of such defects on the characteristics of the parts were also studied. K.L.

N80-16105*# Boeing Aerospace Co., Seattle, Wash.

MANUFACTURING PROCESSES FOR FABRICATING GRAPHITE/PMR 15 POLYIMIDE STRUCTURAL ELEMENTS Contractor Report, Aug. 1977 - Feb. 1979

C. H. Sheppard, J. T. Hoggatt, and W. A. Symonds Feb. 1979 295 p

(Contract NAS1-15009)

(NASA-CR-159129; D180-20545-2) Avail: NTIS HC A13/MF A01 CSCL 11D

Investigations were conducted to obtain commercially available graphite/PMR-15 polyimide prepreg, develop an autoclave manufacturing process, and demonstrate the process by manufacturing structural elements. Controls were established on polymer, prepreg, composite fabrication, and quality assurance. Successful material quality control and processes were demonstrated by fabricating major structural elements including flat laminates, hat sections, I beam sections, honeycomb sandwich structures, and molded graphite reinforced fittings. Successful fabrication of structural elements and simulated section of the space shuttle aft body flap shows that the graphite/PMR-15 polyimide system and the developed processes are ready for further evaluation in flight test hardware. A.R.H.

N80-16106*# Michigan Univ., Ann Arbor.
INCREASED FRACTURE TOUGHNESS OF GRAPHITE-EPOXY COMPOSITES THROUGH INTERMITTENT INTERLAMINAR BONDING Final Report, Nov. 1978 - Oct. 1979
David K. Felbeck and Li-Chung Jee Jan. 1980 36 p refs
(Grant NGR-23-005-528)
(NASA-CR-159188) Avail: NTIS HC A03/MF A01 CSCL 11D

Intermittent interlaminar bonding, which can lead to a large increase in the fracture surface area, was achieved through the introduction of thin perforated Mylar between the layers of a multi-layer continuous-filament graphite-epoxy composite. For the best optimum condition included in this study, fracture toughness was increased from about 100 kJ/sq m for untreated specimens to an average of about 500 kJ/sq m, while tensile strength dropped from 500 MPa to 400 MPa, and elastic modulus remained the same at about 75 GPa. An approximate analysis is presented to explain the observed improvement in toughness. A.R.H.

N80-16107*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PREDICTION OF FIBER COMPOSITE MECHANICAL BEHAVIOR MADE SIMPLE
C. C. Chamis 1980 26 p refs Presented at the 35th Ann. Conf. of the Reinforced Plastics/Composites Inst., New Orleans, 4-8 Feb. 1980; sponsored by the Soc. of Plastics Ind.
(NASA-TM-81404; E-331) Avail: NTIS HC A03/MF A01 CSCL 11D

The elastic properties and failure stresses of angleplied fiber composite laminates were determined using a pocket calculator. The procedure uses simple equations and appropriate graphs of elastic properties versus angle plies, and can handle all types of fiber composites including hybrids. The versatility and generality of the method is illustrated in several step-by-step numerical examples. A.R.H.

N80-16108# California Univ., Livermore. Lawrence Livermore Lab.
SINTERING KINETICS OF PURE AND DOPED BORON CARBIDE
R. G. Lange, Z. A. Munir, and J. B. Holt 11 Jun. 1979 12 p refs Presented at the 5th Intern. Conf. on Sintering and Related Phenomena, Notre Dame, Ind., 18 Jun. 1979
(Contract W-7405-eng-48)
(UCRL-82515; CONF-790682-3) Avail: NTIS HC A02/MF A01

The sintering of pure and doped boron carbide was investigated over the temperature range 1898 K to 2380 K and at additive levels ranging from 0.75 to 10.0 percent. The addition of 0.75 and 3.8 wt percent of AlF3, Ni, Fe, and Cu deactivated the sintering of B4C at all temperatures. In contrast, the addition of 10.0 wt percent these additives resulted in enhanced shrinkage in B4C for the temperatures 1898 K and 2133 K. At the highest temperature, 2380 K, the addition of 10.0 wt percent AlF3 was the only case where enhanced shrinkage was observed. In this case, X-ray analysis showed the formation of a B12C2Al compound and the release of fluorine. These results are interpreted in terms of a grain-boundary diffusion process for pure and doped B4C. DOE

N80-16109# Los Alamos Scientific Lab., N. Mex.
PREPARATION OF FIBER REINFORCED TITANIUM DIBORIDE AND BORON CARBIDE COMPOSITE BODIES
L. R. Newkirk, R. E. Riley, H. Sheinberg, F. A. Valencia, and T. C. Wallace 1979 11 p refs Presented at the Intern. Conf. on Chem. Vapor Deposition, Los Angeles, 14 Oct. 1979
(Contract W-7405-eng-36)
(LA-UR-79-969; CONF-791017-3) Avail: NTIS HC A02/MF A01

A process is described for uniformly infiltrating woven carbon cloth with either titanium diboride or boron carbide at reduced pressure (15 to 25 torr). The effects of deposition temperature on the uniformity of penetration and on coating rate are described for temperatures from 750 to 1000 C and deposit loadings from 20 to 43 volume percent. For the boron carbides, boron composition is discussed and evidence is presented suggesting that propene is the dominant rate controlling reactant. DOE

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N80-16110 Colorado State Univ., Fort Collins.
ENVIRONMENTAL PARTICULATES: CHARACTERIZATION BY HELIUM PLASMA AND ELUCIDATION OF FORMATION PROCESSES Ph.D. Thesis
Christopher Francis Bauer 1979 343 p
Avail: Univ. Microfilms Order No. 7928503

An evolved gas analysis/emission spectrometer system capable of identifying inorganic compounds at trace levels in solid samples, especially environmental particulates, is described. Identification of a given compound is based on the coincident observation of its metal and nonmetal components at its temperature of vaporization. This coincidence exists for the pure halide, sulfide, and sulfate salts of Cd, Hg, Pb, and Zn. In real samples, however, a number of obstacles may hamper identification, most importantly, chemical reactions in the sample which alter the identity of compounds before vaporization. Nevertheless, most of the compounds, when vaporized from a silica matrix, retained the coincidence between metal and nonmetal, despite the fact that reactions did occur. Dissert. Abstr.

N80-16111 California Univ., Berkeley.
HEAVY HYDROCARBONS FROM COAL GASIFICATION VAPOR PRESSURES AND DEW POINT Ph.D. Thesis
Albert Brian Macknick 1979 110 p
Avail: Univ. Microfilms Order No. 8000429

Experimental vapor pressure data at near-ambient temperatures were measured for seven heavy hydrocarbons. Semitheoretical methods are recommended for extrapolating the data to higher temperatures. Because it is not always feasible economically to determine experimentally all vapor pressure data required, a group contribution method is presented which gives parameters for a vapor pressure equation, where all parameters are obtained from molecular structure only. Techniques are presented which allow classification of heavy hydrocarbon mixtures so that vapor pressures and molecular weights needed for dew point calculations can be estimated with a minimum amount of experiment effort. A computer program is used to predict conditions for two tars obtained from coal gasification pilot plants. Dissert. Abstr.

N80-16112 California Univ., Berkeley.
MASS TRANSFER CONTROLLED REACTIONS IN PACKED BEDS AT LOW REYNOLDS NUMBERS Ph.D. Thesis
Peter S. Fedkiw 1979 254 p
Avail: Univ. Microfilms

Mass-transfer data were experimentally taken in a transport controlled, flow-through porous electrode to test the theoretical calculations and to provide data presently unavailable for deeper beds. It was found that the sinusoidal PCT model could not fit the data of this work or that available in the literature. However, all data could be adequately described by a model which incorporates a channeling effect. The bed was successfully modeled as an array of dual sized straight tubes. Dissert. Abstr.

N80-16113 California Inst. of Tech., Pasadena.
THE DEVELOPMENT AND UTILIZATION OF INELASTIC ELECTRON TUNNELING SPECTROSCOPY AS A TOOL FOR INVESTIGATING FUNDAMENTAL CATALYTIC PROCESSES Ph.D. Thesis
Howard Edwin Evans 1980 270 p
Avail: Univ. Microfilms Order No. 8002586

A diverse number of reactant/catalyst systems were investigated utilizing inelastic electron tunneling spectroscopy (IETS) to probe the vibrational structures of the various surface species. These studies include observation of an ethoxide-to-acetate transformation above 470 K for ethanol on alumina, demonstrating that IETS effectively monitors surface reactions. Characterization of surface acetates formed on alumina is obtained via analysis of IET spectra, as is information on the initial

adsorption mechanism for each species. Results obtained for ethanol adsorption on alumina-supported silver particles extend the use of IETS into areas of supported metal catalysis. The IETS technique was also used to characterize the structure of $Zr(BH_4)_4$ supported on aluminum oxide. Dissert. Abstr.

N80-16114 Notre Dame Univ., Ind.
EXPERIMENTAL AND THEORETICAL INVESTIGATION OF ETHYLENE OXIDATION IN A FIXED-BED REACTOR
Ph.D. Thesis
Stephen Carl Paspek, Jr. 1980 144 p
Avail: Univ. Microfilms Order No. 8002621

The intrinsic kinetics of ethylene oxidation, in excess oxygen, over supported platinum catalyst was determined in a spinning basket-type gradientless reactor. The same catalyst was then introduced into both adiabatic and non-adiabatic fixed-bed reactors. Using a mixture of ethylene and oxygen as the reactor feed, the behavior of both reactors was experimentally determined over a wide range of operating conditions. Overall conversions, as well as axial temperature profiles were recorded. Employing the most accurate model, predictions of experimental reactor behavior were made, and the accuracy of the predictions was determined by subsequent experimentation. Results indicate that a one-dimensional two-phase model, including solid conduction, can accurately predict the behavior of this experimental fixed-bed reactor system for a variety of operating conditions.
Dissert. Abstr.

N80-16115 Ohio State Univ., Columbus.
THE REDUCTION OF SILICA AND MULLITE IN HYDROGEN
Ph.D. Thesis
Chung-I Chen 1979 185 p
Avail: Univ. Microfilms Order No. 8001706

A theory was developed to deal with kinetics, thermodynamics, and mass transport phenomena simultaneously for reactions which generate gaseous products. The reaction of fused silica with hydrogen was investigated using this theory. For reactions controlled by product transport, the partial pressures of gaseous reactants and products were assumed to be in equilibrium at the reaction surface with the transport rate of the gaseous products proportional to the equilibrium partial pressures. The thermodynamic properties, the transport properties, and the kinetic model were solved by relating the equilibrium constant and mass transfer equation. Dissert. Abstr.

N80-16116* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CATALYSTS FOR POLYIMIDE FOAMS FROM AROMATIC ISOCYANATES AND AROMATIC DIANHYDRIDES Patent
Salvatore R. Riccitiello, Paul M. Sawko, and Carlos A. Estrella, inventors (to NASA) Issued 4 Dec. 1979 5 p Filed 24 Feb. 1978 Supersedes N78-221156 (16 - 13, p 1674)
(NASA-Case-ARC-11107-1; US-Patent-4,177,333; US-Patent-Appl-SN-883961; US-Patent-Class-521-124; US-Patent-Class-521-125; US-Patent-Class-521-127; US-Patent-Class-521-157; US-Patent-Class-528-73) Avail: US Patent and Trademark Office CSCL 07D

Polyimide foam products having greatly improved burn-through and flame-spread resistance are prepared by the reaction of aromatic polyisocyanates with aromatic dianhydrides in the presence of metallic salts of octoic acid. The salts, for example stannous octoate, ferric octoate and aluminum octoate, favor the formation of imide linkages at the expense of other possible reactions.
Official Gazette of the U.S. Patent and Trademark Office

N80-16117*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TRENDS IN MATERIALS' OUTGASSING TECHNOLOGY
Joe A. Colony Nov. 1979 27 p
(NASA-TM-80585) Avail: NTIS HC A03/MF A01 CSCL 07D

Test sample acquisition and chemical analysis techniques for outgassing products from spacecraft, experiment modules, and support equipment is described. The reduction of test data to a computer compatible format to implement materials selection policies is described. A list of the most troublesome outgassing species is given and several materials correlations are discussed. Outgassing from solar panels, thermal blankets, and wire insulation are examined individually. M.G.

N80-16118*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
NITROGEN DIOXIDE VAPOR PENETRATION OF CHLOROBUTYL RUBBER SCAPE UNDER OPERATIONAL CONDITIONS
Thomas A. Schehl and Thomas W. Beall Feb. 1980 78 p refs
(NASA-TP-1805) Avail: NTIS HC A05/MF A01 CSCL 07D

Operational self contained atmospheric protective ensembles (SCAPE suits) and fabric from the suits were subjected to a series of tests designed to determine the amount of exposure a wearer of the suit would receive if a spill of the hypergolic oxidizer nitrogen tetroxide (N_2O_4) should occur nearby. The results of these tests show that a wearer of a 'stock' SCAPE suit equipped with a standard liquid air pack, if exposed to a spill resulting in a 26 percent increase of oxidizer in the surrounding atmosphere, will experiment no detectable concentration of nitrogen dioxide (NO_2) inside the suit for 15 minutes. Thereafter, the NO_2 concentration within the suit will increase for 35 minutes at a rate of 0.07 ppm per minute and then at a gradually decreasing rate until an equilibrium concentration of 3.4 ppm is attained after 100 minutes. Momentary increases of as much as 1.6 ppm can be expected if the wearer were to rise quickly from a squatting position, but the additional NO_2 would be dissipated within three minutes. The effect of liquid and vapor N_2O_4 and of liquid monomethylhydrazine on permeation rates and tensile strength of the SCAPE suit fabric was also investigated. Author

N80-16119# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
A NUMERICAL MODEL OF HIGH INTENSITY CONFINED HYDROCARBON FLAMES
H. A. Arbib, Y. Goldman, J. B. Greenberg, and Y. M. Timnat Oct. 1978 65 p refs
(TAE-322) Avail: NTIS HC A04/MF A01

A computer program was developed for predicting flow field properties and species concentration distributions in side an axisymmetrical combustion chamber. A complex combuster geometry was considered, with an initial diffuser with divergence half angle of 45 degrees, and a short tunnel followed by a sudden expansion, in order to produce a strong recirculating pattern to stabilize the flame. The fuel (kerosene) and oxidant (air) emerged, premixed and in gaseous form from the central injection nozzle. A two equation model of turbulance was employed, and the complex kinetics of kerosene-air combustion by a three step global mechanism, for hydrocarbon attack, CO oxidation, and water formation are described. R.C.T.

N80-16120# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Chemistry.
CHARACTERISTICS OF VERY CONCENTRATED AQUEOUS SOLUTIONS
K. S. Pitzer Aug. 1979 53 p refs Presented at the Nobel Symp. on Chem. and Geochem. of Solutions at High Temperature and Pressure, Bofors, Karlskoga, (Sweden), 16 Sep. 1979
(Contract W-7405-eng-48)
(LBL-9660) Avail: NTIS HC A04/MF A01

The electrical conductance and thermodynamic properties (activities) are described for the aqueous electrolytes which have been investigated over the full range from fused salt to pure water. The activities are well represented by a simple equation originally proposed for nonelectrolytes. Comments are made concerning the properties of various strong electrolytes up to saturation concentration and their dependence on temperature up to 300 C. These properties are accurately represented by virial-coefficient equations. DOE

N80-16121# Illinois Inst. of Tech., Chicago. Dept. of Chemical Engineering.
ELECTROCHEMISTRY OF ACETYLIDES, NITRIDES AND CARBON CATHODES IN MOLTEN HALIDES
J. R. Selman May 1979 9 p refs
(Contract EG-77-S-02-4445)
(COO-4445-T1) Avail: NTIS HC A02/MF A01

The Delta G/sub f/ of Li2C/sub x/ and CaC/sub x/ were determined to be -47.02 kcal/mole at 700 K and -31.44 kcal/mole at 823 K, respectively. They confirm that the potential of carbon electrodes in acetylide melts is a mixed potential, governed by lithium or calcium intercalation simultaneously with acetylide-ion discharge: Li(+) + x C yields LiC/sub x/e(-), and C2(2-) yields 2C + 2e(-). DOE

N80-16122# Hebrew Univ., Jerusalem (Israel). Dept. of Physical Chemistry.
NATURE OF OXYGEN CONTAINING RADICALS IN RADIATION CHEMISTRY AND PHOTOCHEMISTRY OF AQUEOUS SOLUTIONS Annual Progress Report, Sep. 1978 - Jul. 1979
G. Czapski 1979 42 p
(Contract EY-76-C-02-3221)
(COO-3221-60) Avail: NTIS HC A03/MF A01

The properties of HO2, O2(-), and O were studied in relation to their role in biological systems. The redox potentials of free radicals were determined with emphasis on the redox potential of O2(-). The possibility of formation of OH from O2(-), the role of OH, O2(-), and oxygen in radiation damage to cells, and the mechanism of oxygen toxicity in biological processes are among topics discussed. Recommendations for further research are given. J.M.S.

N80-16123# Los Alamos Scientific Lab., N. Mex.
HIGH RESOLUTION SATURATION SPECTROSCOPY WITH CO2 LASERS. APPLICATION TO THE NU SUB 3 BANDS OF SF6 AND OsO4
C. J. Borde, M. Ouhayoun, A. VanLerberghe, C. Salomon, S. Avrillier, C. D. Cantrell, and J. Borde 1979 14 p refs Presented at the 4th Intern. Conf. on Laser Spectry., West Berlin, 11-15 Jun. 1979 Prepared in cooperation with Paris XIII Univ., Villetaneuse, France and Chicago Univ., Ill.
(Contract W-7405-eng-36)
(LA-UR-79-1913; CONF-790690-2) Avail: NTIS HC A02/MF A01

Topics covered include: (1) the frequency-controlled saturation spectrometer; (2) application to the rotational fine structure of the V3 band of (S-32)F6 and determination of a new set of spectroscopic parameters; (3) magnetic hyperfine structure of the SF6 lines, evidence for a spin-vibration interaction; (4) direct optical observation of the ground state octahedral splittings of SF6 and violation of the delta C = O selection rule; and (5) fine and hyperfine structure studies in the V3 band of OsO4. DOE

N80-16124# North Carolina State Univ. at Raleigh. Dept. of Nuclear Engineering.
HYDROGEN DIFFUSION, DISSOLUTION AND PERMEATION OF NONMETALLIC SOLIDS
T. S. Elleman, D. Rao, K. Verghese, and L. Zumwalt 1979 187 p refs
(Contract EY-76-S-05-4721)
(ORO-4721-T1) Avail: NTIS HC A09/MF A01

Hydrogen diffusion, dissolution, and permeation in metal oxides, carbides, nitrides, halides, and hydrides are reviewed. These data are for the development of fusion reactor blankets but should also be generally useful in technologies that involve interactions between hydrogen and nonmetals. DOE

N80-16125# Oak Ridge National Lab., Tenn.
CONVERSION OF ISOTOPE COMPOUNDS TO METAL BY REDUCTION-DISTILLATION METHODS
E. H. Kobisk 1978 26 p refs Presented at the Conf. of the Intern. Nucl. Target Develop. Soc., Munchen-Garching, West Germany, 11 Sep. 1978
(Contract W-7405-eng-26)
(CONF-780943-2) Avail: NTIS HC A02/MF A01

The reduction of a solid compounded isotope, followed by metal distillation into a noncontaminating collector vessel is discussed. A variety of isotope metal vapor condensation-collection methods and subsequent treatment of the product to form various physical forms are discussed. Limitations of this technique with regard to reducible cations other than those noted earlier are discussed, together with the consequences of volatilization of some metal suboxides in this process. DOE

N80-16126# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
COMBUSTION OF MULTICOMPONENT FUEL DROPLETS Final Report
H. S. Homan Jul. 1979 28 p refs
(Contract EC-77-S-02-4449)
(COO-4449-2) Avail: NTIS HC A03/MF A01

The vaporization and burning of liquid fuel droplets which contain more than one chemical component were investigated. The prediction of the transient rate of changes in chemical composition of multi-component liquid fuel droplets during vaporization and burning in convective flow was considered. A model is provided of droplet burning which is more relevant to droplet vaporization and combustion in fuel sprays than the droplet combustion models which assume spherical symmetry, single-component fuel, and constant droplet properties. The model is expected to impact the models of combustion in diesel engines, gas turbines, and furnaces especially for the heavy shale and coal-derived fuels. DOE

N80-16127# California Univ., Livermore. Lawrence Livermore Lab.
APPARATUS AND TECHNIQUES FOR THE STUDY OF PRECIPITATION OF SOLIDS AND SILICA FROM HYPER-SALINE GEOTHERMAL BRINE
J. H. Hill, J. E. Harrar, C. H. Otto, Jr., S. B. Deutscher, H. E. Crampton, R. G. Grogan, and V. H. Hendricks 5 Jul. 1979 12 p refs
(Contract W-7405-eng-48)
(UCRL-52799) Avail: NTIS HC A02/MF A01

Apparatus and techniques for the collection and examination of geothermal brine samples under anaerobic conditions and within minimum cooling are discussed. The concentration of suspended solids is measured gravimetrically after filtration, and the concentration of dissolved silica is measured by atomic absorption spectrophotometry. Well site data illustrate the typical results of the procedures. DOE

N80-16128# California Univ., Berkeley. Lawrence Berkeley Lab. Physics, Computer Science and Mathematics Div.
THEORETICAL STUDY OF A REACTION-DIFFUSION MODEL FOR FLAME PROPAGATION IN A GAS Ph.D. Thesis
S. S. Lin Jul. 1979 114 p refs
(Contract W-7405-eng-48)
(LBL-9487) Avail: NTIS HC A06/MF A01

Assuming the existence of a positive ignition temperature, it was proven that, for an arbitrary Lewis number, (1) there is a unique flame front associated with each unburned gas state. When the Lewis number is one, the model equation can be reduced to a scalar reaction-diffusion equation. It was proven further that (2) if the initial gas states are close to a flame front, then the gas mixture evolves into the flame front at an exponential rate. In particular, each flame front is stable under finite amplitude perturbation. (3) For general initial gas states, the gas mixture evolves asympotically into a suitable combination of flame fronts. DOE

N80-16129# Department of Energy, Pittsburgh, Pa. Energy Technology Center.
STABILITY STUDIES OF COAL LIQUIDS
F. R. Brown and F. S. Kam Aug. 1979 23 p refs
(PETC/TR-79/5) Avail: NTIS HC A02/MF A01

The aging characteristics of liquid products derived from the hydrogenation of coal were studied. Viscometric, spectrometric, ultimate analysis, solvent separations, and oxygen consumption measurements were employed to monitor the storage properties of the coal liquids under a variety of environmental conditions. Using viscosity measurements as the primary probe of changes in the stored samples, the rate of product degradation was found to be related to the initial viscosity of the sample, the storage temperature and the concentration of oxygen in the gaseous environment over the samples. Fractions of gross coal liquid samples obtained by solvent separation methods were monitored for their rates of oxygen consumption in order to more accurately determine those materials most susceptible to oxidation, and concurrent degradation of the product. The results show that coal liquids are very susceptible to oxidative degradation. DOE

N80-16130# Department of Energy, Bartlesville, Okla.
DEVELOPMENT OF HIGH TEMPERATURE SUBTRACTIVE COLUMN AND CHROMATOGRAPHIC ANALYSIS OF HYDROCARBONS PRESENT IN DIESEL EXHAUST
Clarence J. Raible and D. E. Seizinger Dec. 1978 11 p refs
(BETC/RI-78/12) Avail: NTIS HC A02/MF A01

A high-temperature subtractive column was developed for distinguishing diesel fuel and exhaust hydrocarbons into two classifications, i.e., saturated and unsaturated hydrocarbons. Duplicate samples were collected with and without a subtractive column and subsequently analyzed by gas liquid chromatography to determine boiling range distribution of exhaust hydrocarbons. Comparison of the resulting chromatographic data permitted determination of hydrocarbon class as well as boiling range distribution. The analytical procedure was developed for classification of hydrocarbons in the range C7 to C22. The loss of saturated compounds within the subtractive column was a reproducible 6 percent over the analyzed hydrocarbon range. Compensation for losses during sample transfer was accomplished by including the transfer steps in the calibration procedure. DOE

N80-16131# Versar, Inc., Springfield, Va.
SURVEY OF POTENTIAL CHLORINE PRODUCTION PROCESSES Final Report
Apr. 1979 196 p refs Prepared for Argonne Natl. Lab., Ill.
(Contract W-31-109-eng-38)
(ANL/OEPM-79-1) Avail: NTIS HC A09/MF A01

A computerized literature search of past and current chlorine generation methods was performed to identify basic chlorine production processes. Over 200 pertinent references are cited involving 20 separate and distinct chlorine processes. Each basic process is evaluated for its engineering and economic viability and energy efficiency in terms of raw material availability, type and amount of energy required, by-product demand/disposal, and status of development. The most promising processes are the membrane process (with and without catalytic electrodes), Kel-Chlor, Mobay (direct electrolysis of hydrogen chloride), the Shell process (catalytic oxidation of hydrogen chloride), and oxidation of ammonium chloride. DOE

N80-16132# Montana State Univ., Bozeman. Fisheries Bioassay Lab.
AQUEOUS AMMONIA EQUILIBRIUM - TABULATION OF PERCENT UN-IONIZED AMMONIA Extramural Report, 1 Jan. 1971 - 31 Dec. 1975
Robert V. Thurston, Rosemarie C. Russo, and Kenneth Emerson Aug. 1979 437 p refs
(Grant EPA-R-800861)
(PB80-103518; EPA-600/3-79-091) Avail: NTIS HC A19/MF A01 CSCL 07D

The percent of un-ionized ammonia as a function of pH and temperature in aqueous ammonia solutions of zero salinity is presented in tabular form over the following ranges: temperature 0.0 to 40.0 C in increments of 0.2 degree, and pH 5.00 to 12.00 in increments of 0.01 pH unit. GRA

N80-16133# Chemical Systems, Inc., Tustin, Calif.
DEVELOPMENT OF DRY PROCESS MICROPOROUS POLYSULFONE SUPPORTS FOR ULTRATHIN FILM COMPOSITES Final Report
R. E. Kesting 1979 35 p refs
(Contract DI-14-34-0001-8537)
(PB-300488/4; W79-09839) Avail: NTIS HC A03/MF A01 CSCL 07D

A dry process microporous support of polybutylene terphthalate (P13T) was developed. It appears to be superior to wet process polysulfone because its membranes are: (1) more solvent resistant; (2) wet-dry reversible due to traces of polyvinylalcohol (PVA); (3) solvent cast onto polyethlene terphthalate (PET) and forms an integral bond and cannot be removed inadvertently during handling or operation; and (4) made of an optimum high density of 0.1 millimicron pores. The best results were obtained with PET (6 PRO Eastman) 5g, polyvinyl alcohol (Gelvatol 20-30 Monsanto) 5g, HFIP 90g. GRA

N80-16134# Permutit Co., Inc., Princeton, N. J.
PRETREATMENT OF SEAWATER FOR REVERSE OSMOSIS PROCESSES, 1976
Arthur C. Epstein 1979 160 p refs
(Contract DI-14-30-3242)
(PB-300509/7; W79-09831; OWRT-3242(1)) Avail: NTIS HC A08/MF A01 CSCL 07D

Sea water pretreatment systems which precede reverse osmosis systems were studied. The systems studied include: (1) a baseline system which consisted of sand filtration followed by cartridge filtration and a carbon filter for chlorine removal ahead of the hollow fiber polyamide membrane; (2) a coagulation pretreatment system which consisted of an upflow sludge blanket precipitator followed by a polishing filter and cartridge filter, and a carbon filter for removal of chlorine ahead of the hollow fiber polyamide membrane; and (3) an in-line coagulation performed ahead of the base-line pretreatment system. The feed to all three systems was chlorinated/microscreened sea water. The pretreated effluent from systems one and two was used as feed to either a spiral wound thin film composite membrane or a hollow fiber polyamide membrane. System two and three provided water with acceptable plugging factors for feeding reverse osmosis systems. The economics of the three pretreatment systems were determined for a flow rate of four million gallons per day. GRA

N80-16135# National Bureau of Standards, Washington, D.C.
STANDARD REFERENCE MATERIALS: MICRO-HOMOGENEITY STUDIES OF NBS STANDARD REFERENCE MATERIALS, NBS RESEARCH MATERIALS, AND OTHER RELATED SAMPLES Final Report
R. B. Marinenko, K. F. J. Heinrich, and F. C. Ruegg Sep. 1979 88 p refs
(PB-300461/1; NBS-SP-260-65; LC-79-600121) Avail: NTIS HC A05/MF A01 CSCL 14B

A simple routine technique for studying homogeneity in the micrometer range with the electron microprobe is described. For graphic display, a digital periodic integrator is used. In conjunction with scalers and a stepping motor on the sample stage, traces similar to industrial control charts based on a comparison of the experiment with the expected (Poisson) counting statistics are quickly obtained. A computer program developed to numerically evaluate sample homogeneity is used to test several standard reference materials (SRMs). These include the iron and steels (SRMs 661-664, 461, and 463), the gold-copper and gold-silver alloys (SRMs 481 and 482), the tungsten-20 percent molybdenum alloy (SRM 480), cartridge brass (SRM 478), and the iron-chromium-nickel alloy (SRM 479a). GRA

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N80-16136 Illinois Univ. at Chicago Circle, Chicago.
MAGNETIC PROPERTIES OF SELECTED TRANSITION METAL COMPOUNDS Ph.D. Thesis
Kyong Ok Joung 1979 126 p
Avail: Univ. Microfilms Order No. 7925991

Ac magnetic susceptibilities as a function of temperature at zero field or as a function of external magnetic field at constant temperature were measured by the mutual inductance methods for the following compounds: (1) [Co(C5H5NO)6](NO3)2; (2) [Ni(C5H5NO)6](NO3)2; (3) [Ni2(en)4C12]C12; and (4) Co(H2O)Cl2(2 urea), where urea is (NH2)2CO. Dissert. Abstr.

N80-16137 North Texas State Univ., Denton.
FORMATION OF SUPERSATURATED ALLOYS BY ION IMPLANTATION AND PULSED-LASER ANNEALING Ph.D. Thesis
Syd Robert Wilson 1979 174 p
Avail: Univ. Microfilms Order No. 8000814

Supersaturated substitutional alloys formed by ion implantation and rapid liquid-phase epitaxial regrowth induced by pulsed-laser annealing were studied using Rutherford backscattering and ion channeling analysis. A series of impurities (As, Sb, Bi, Ga, In, Fe, Zn, Cu) were implanted into single-crystal (001) orientation silicon at does ranging from 1 x 10 to the 15th power/ sq cm to 1 x 10 to the 17th power sq cm. The

samples were subsequently annealed with a Q-switched ruby laser. Ion channeling analysis shows that laser annealing incorporates the Group 3 (Ga, In) and Group V (As, Sb, Bi) impurities into substitutional lattice sites at concentrations far in excess of the equilibrium solid solubility. Channeling measurements indicate the silicon crystal is essentially defect free after laser annealing. Dissert. Abstr.

N80-16138 State Univ. of New York at Stony Brook.
CORROSION BEHAVIOR OF Ni IMPLANTED STEEL Ph.D. Thesis
Shashi Bhushan Agarwal 1979 306 p
Avail: Univ. Microfilms Order No. 8000248

The compositional, structural, and electrochemical properties of Ni-implanted 430 stainless steel were analyzed. The compositional analysis revealed a larger concentration of Ni on the surface than predicted by LSS theory. Also, an extensive radiation damage was observed in the implanted material in the form of entangled dislocation network. The extent of damage was found to increase with Ni concentration. Ion implantation was found to be accompanied by sputtering of the surface. A considerable roughening of the surface occurs which is highlighted by impurities and defects in the substrate. The electrochemical behavior of 430 stainless steel was considerably modified by Ni implantation. These modifications include changes in anodic behavior of 430 stainless steel and in passivation parameters of 430 stainless steel. Dissert. Abstr.

N80-16139 Cincinnati Univ., Ohio.
THE EFFECTS OF INTERSTITIAL IMPURITIES RADIATION TEMPERATURE ON VOIDS SWELLING AND IRRADIATION HARDENING IN THE NEUTRON IRRADIATED MOLYBDENUM Ph.D. Thesis
Shaw-Rong Scott Liu 1979 282 p
Avail: Univ. Microfilms Order No. 7922607

Molybdenum specimens of three different impurity levels (residual resistivity ratios of 60, 650 and 6320, respectively), irradiated in the Oak Ridge Research Reactor to a fast neutron fluence of 1 x 10 to the 21st power n/sq cm (E > 0.1 MeV) at ten different temperatures ranging from 220 to 900 C were studied using transmission electron microscopy (TEM), small-angle X-ray scattering (SAXS) and knoop microhardness measurements. The TEM results showed that the microstructure consisted of voids, black spots and loops, rafts and dislocation segments. All were present at the lower irradiation temperatures, while only voids and dislocation segments were present at the higher temperatures. SAXS experiments also indicated that voids formed in the specimens irradiated at temperatures ranging from 220 to 900 C. The TEM and SAXS results suggest that the possible threshold temperature of void formation is possibly as low as 150 C (0.15 T sub m) in molybdenum. Dissert. Abstr.

N80-16140 Iowa Univ., Iowa City.
THE EFFECTS OF STRAIN RATE AND STRAIN HISTORY ON THE DYNAMIC BEHAVIOR OF METALLIC MATERIALS Ph.D. Thesis
Ming-Chuen Yip 1979 112 p
Avail: Univ. Microfilms Order No. 7928634

The constitutive equations for strain hardening (FCC metals and alloys) and strain softening-hardening metallic materials (BCC metals and alloys) were developed within the framework of the endochronic theory of viscoplasticity. The constitutive equation is applied to describe the cyclic hardening behavior of materials at a prescribed constant strain rate. The theoretical stress-strain relation for each cycle under total strain control is presented, and the peak stress of each cycle under different controlled total strain is obtained. Wave propagation of strain hardening materials with both prestraining and strain rate history effects was investigated. The strain-time profiles were obtained and are presented for comparison with experimental data. The difference between the constant total strain rate and the constant plastic strain rate is discussed. Dissert. Abstr.

N80-16141*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SCANNING-ELECTRON-MICROSCOPE STUDY OF NORMAL-IMPINGEMENT EROSION OF DUCTILE METALS
William A. Brainard and Joshua Salik Jan. 1980 11 p refs (NASA-TP-1609; E-085) Avail: NTIS HC A02/MF A01 CSCL 11F

Scanning electron microscopy was used to characterize the erosion of annealed copper and aluminum surfaces produced by both single- and multiple-particle impacts. Macroscopic 3.2 mm diameter steel balls and microscopic, brittle erodant particles were projected by a gas gun system so as to impact at normal incidence at speeds up to 140 m/sec. During the impacts by the brittle erodant particles, at lower speeds the erosion behavior was similar to that observed for the larger steel balls. At higher velocities, particle fragmentation and the subsequent cutting by the radial wash of debris created a marked change in the erosion mechanism. Author

N80-16142*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STRESS CORROSION CRACKING EVALUATION OF MARTENSITIC PRECIPITATION HARDENING STAINLESS STEELS
T. S. Humphries and E. E. Nelson Jan. 1980 34 p refs (NASA-TM-78257) Avail: NTIS HC A03/MF A01 CSCL 11F

The resistance of the martensitic precipitation hardening stainless steels PH13-8Mo, 15-5PH, and 17-4PH to stress corrosion cracking was investigated. Round tensile and c-ring type specimens taken from several heats of the three alloys were stressed up to 100 percent of their yield strengths and exposed to alternate immersion in salt water, to salt spray, and to a seacoast environment. The results indicate that 15-5PH is highly resistant to stress corrosion cracking in conditions H1000 and H1050 and is moderately resistant in condition H900. The stress corrosion cracking resistance of PH13-8Mo and 17-4PH stainless steels in conditions H1000 and H1050 was sensitive to mill heats and ranged from low to high among the several heats included in the tests. Based on a comparison with data from seacoast environmental tests, it is apparent that alternate immersion in 3.5 percent salt water is not a suitable medium for accelerated stress corrosion testing of these pH stainless steels. A.R.H.

N80-16143*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SOME CONSIDERATIONS OF THE PERFORMANCE OF TWO HONEYCOMB GAS PATH SEAL MATERIAL SYSTEMS
Robert C. Bill and Lawrence T. Shiembob 1980 29 p refs To be presented at the Ann. Meeting of the Am. Soc. of Lubrication Engr., Anaheim, Calif., 5-8 May 1980 Prepared in cooperation with Army Aviation Research and Development Command, Cleveland, and Pratt and Whitney Aircraft Group, East Hartford, Conn.
(NASA-TM-81398; AVRACOM-TR-79-33; E-032) Avail: NTIS HC A03/MF A01 CSCL 11F

A standard Hastelloy-X honeycomb material and a pack aluminide coated honeycomb material were evaluated as to their performance as labyrinth seal materials for aircraft gas turbine engines. Consideration from published literature was given to the fluid sealing characteristics of two honeycomb materials in labyrinth seal applications, and their rub characteristics, erosion resistance, and oxidation resistance were evaluated. The increased temperature potential of the coated honeycomb material compared to the uncoated standard could be achieved without compromising the honeycomb material's rub tolerance, although there was some penalty in terms of reduced erosion resistance. Author

N80-16144# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Metallurgy and Materials Science.
ELASTIC AND PLASTIC STRAINS AND THE STRESS CORROSION CRACKING OF AUSTENITIC STAINLESS STEELS Final Report
F. P. Vaccaro, R. F. Hehemann, and A. R. Troiano Aug. 1979 133 p refs
(Contract EY-76-S-02-2576)
(COO-2576-9) Avail: NTIS HC A07/MF A01

The influence of elastic (stress) and plastic (cold work) strains on the stress corrosion cracking (SSC) of a transformable austenitic stainless steel was studied in several aqueous chloride environments. Initial polarization behavior was active for all deformation

conditions as well as for the annealed state. The development of a pseudo-passive (flawed) film leading to localized corrosion, occluded cells and SCC was indicated. The latter did not initiate during active corrosion regardless of the state of strain unless severe low temperature deformation produced a high percentage of martensite. Both elastic and plastic deformation increased the sensitivity to SCC when examined on the basis of percent yield strength. The corrosion potential, the critical cracking potential, and the potential at which the current changes from anodic to cathodic were essentially unaffected by deformation. Apparently the basic electrochemical parameters are independent of the bulk properties of the alloy and totally controlled by surface phenomena. DOE

N80-16145# Los Alamos Scientific Lab., N. Mex.
IRRADIATION DAMAGE IN METALS PRODUCED BY 800-MeV PROTONS
R. D. Brown, W. F. Sommer, and W. V. Green Jul. 1979 14 p
(Contract W-7405-eng-36)
(LA-7939-MS) Avail: NTIS HC A02/MF A01

To allow irradiation of samples on a routine basis, a proton irradiation port (PIP) was constructed in beam line A at LAMPF. This port allowed a high damage-rate irradiation of metal foils several mils thick. Irradiations were completed on foils of aluminum, niobium, molybdenum, and vanadium to damage levels between 0.05 dpa and several dpa, the damage occurring at homologous temperatures above 0.5 T/sub m/. Disks were punched from the irradiated foils and thinned for TEM examination. No voids were observed in irradiated aluminum samples. Molybdenum samples showed a low density of cavities which were believed to be gas filled at these high temperatures. Vanadium samples showed a high density of irradiation-produced defects resulting from irradiation-injected impurities. Such defects have been reported previously in ion-irradiated vanadium. The nature of the damage produced is compared to that found at lower temperatures following neutron or ion bombardment. DOE

N80-16146# Argonne National Lab., Ill.
BIAXIAL CREEP-FATIGUE BEHAVIOR OF TYPE 316H STAINLESS STEEL TUBE
S. Majumdar Apr. 1979 31 p refs
(Contract W-31-109-eng-48)
(ANL-79-33) Avail: NTIS HC A03/MF A01

Biaxial creep-fatigue test data for Type 316 stainless steel tubes at 1100 F for use in high-temperature components in solar central receivers are presented. The specimens were subjected to constant internal pressure and fluctuating axial strain with and without hold times in tension as well as compression. The results show that internal pressure significantly affects diametral ratchetting and axial stress range. Axial tensile hold is found to be more damaging than axial compressive hold even under a biaxial state of stress. DOE

N80-16147# Argonne National Lab., Ill.
DEFORMATION HARDENING OF TYPE 304 STAINLESS STEEL AT ELEVATED TEMPERATURE
A. P. L. Turner 1979 9 p refs Presented at 5th Intern. Conf. on the Strength of Metals and Alloys, Aachen, West Germany, Aug. 1979
(Contract W-31-109-eng-38)
(CONF-790801-4) Avail: NTIS HC A02/MF A01

Samples of Type 304 stainless steel were hardened by various deformation paths. The mechanical behavior of these predeformed samples was characterized by their behavior in tensile tests. Dislocation structure was examined by microscope. Behavior during the prior deformation hardening path was analyzed for indications that the state of the material was changing. Results supported the conclusion that more than one state parameter is required to characterize the material. DOE

N80-16148# Oak Ridge National Lab., Tenn.
DISLOCATION MODEL FOR TWINNING AND FRACTURE AND ITS APPLICATION TO HCP METALS
M. H. Yoo 1979 6 p refs Presented at 5th Intern. Conf. on the Strength of Metals and Alloys, Aachen, Aug. 1979
(Contract W-7405-eng-26)
(CONF-790801-3) Avail: NTIS HC A02/MF A01

A dislocation model for deformation twinning and cleavage fracture was developed based on the dislocation theory of fracture and the anisotropic elasticity theory of dislocations. The extension of a Mode-I crack and a deformation twin was treated in a unified manner in terms of the surface energy, the twin boundary energy, and the applied stress state. A criterion was established for predicting twin nucleation or crack initiation and was applied to sixteen hexagonal metals. DOE

N80-16149# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Materials Engineering.
LOCALIZED CORROSION AND STRESS CORROSION CRACKING BEHAVIOR OF AUSTENITIC STAINLESS STEEL WELDMENTS CONTAINING RETAINED FERRITE Annual Progress Report, 1 Jun. 1978 - 31 Mar. 1979
W. F. Savage and D. J. Duquette Mar. 1979 9 p refs
(Contract EY-76-C-02-2462)
(COO-2462-5) Avail: NTIS HC A02/MF A01

The results of the pitting experiments performed on the austenitic stainless steel weldments show that the pressure of delta ferrite decreases localized corrosion resistance with pits initiating preferentially at delta ferrite-gamma austenite interphase boundaries. This increased susceptibility is reversible with elevated temperature heat treatments which revert the metastable ferrite phase to the equilibrium austenite phase. DOE

N80-16150# Knolls Atomic Power Lab., Schenectady, N. Y.
LONG-LIFE FATIGUE TEST RESULTS FOR TWO NICKEL-BASE STRUCTURAL ALLOYS
D. F. Mowbray, E. V. Giaquinto, and F. J. Mehringer Nov. 1978 31 p refs Presented at the Am. Soc. of Mech. Engr.-Mater. Eng. Conf., Washington, D.C., 8 May 1979
(Contract EY-76-C-12-0052)
(KAPL-4105; CONF-790575-1) Avail: NTIS HC A03/MF A01

The results are reported of fatigue tests on two nickel-base alloys, hot-cold-worked and stress-relieved nickel-chrome-iron Alloy 600 and mill-annealed nickel-chrome-moly-iron Alloy 625 in which S-N data were obtained in the life range of 10 to the sixth power to - 10 to the tenth power cycles. The tests were conducted in air at 600 F, in thd reversed membrane loading mode, at a frequency of approximately 1850 Hz. An electromagnetic, closed loop servo-controlled machine, built to perform the tests, is described. DOE

N80-16151# Hanford Engineering Development Lab., Richland, Wash.
EFFECT OF HEAT TREATMENT ON THE ELEVATED TEMPERATURE TENSILE AND FRACTURE TOUGHNESS RESPONSE OF ALLOY 718
W. J. Mills Jun. 1979 55 p refs
(Contract EY-76-C-14-2170)
(HEDL-TME-78-98) Avail: NTIS HC A04/MF A01

The tensile and J/sub Ic/ fracture toughness behavior of Alloy 718 was characterized at room temperature, 427 C (800 F) and 538 C (1000 F). Two different heat treatments were used: the conventional (ASTM A637) treatment, and a modified heat treatment designed to improve the toughness of Alloy 718 base metal and weldments. The strength of the conventionally heat treated Alloy 718 was found to be slightly greater than that of the modified Alloy 718. The elastic-plastic J/sub Ic/ fracture toughness response of the modified Alloy 718 was found to be superior to the J/sub Ic/ behavior exhibited by the conventional material over the entire test temperature range. Metallographic and fractographic examinations of Alloy 718 fracture surfaces revealed that this increase in fracture resistance was related to the dissolution of Widmanstaetten precipitates during the high temperature solution anneal employed in the modified treatment. DOE

N80-16152# Metal Properties Council, Inc., New York.
DEVELOPMENT OF A STANDARD METHODOLOGY FOR THE CORRELATION AND EXTRAPOLATION OF ELEVATED TEMPERATURE CREEP AND RUPTURE DATA. VOLUME 2: A STATE-OF-THE-ART REVIEW Final Report
R. M. Goldhoff Apr. 1979 381 p refs Sponsored by Elec. Power Res. Inst.
(EPRI Proj. 638-1)

(EPRI-FP-1062-Vol-2) Avail: NTIS HC A17/MF A01

Contents: (1) The evaluation of elevated temperature creep and rupture strength data: an historical perspective; (2) pre-analysis assessment of creep-rupture data; (3) a comprehensive method of rupture data analysis with simplified models; (4) status of the minimum-commitment method for creep-rupture applications; and (5) regression analysis of creep-rupture data-a practical approach. A.R.H.

N80-16153# Manlabs, Inc., Cambridge, Mass.
ILLUSTRATION OF TERNARY DIAGRAM SYNTHESIS-Mn-Ti-Fe AND Al-Ti-Fe
Larry Kaufman and D. Dew-Hughes 1979 27 p refs Presented at the Symp. on Calculation of Phase Diagrams and Thermochem., Milwaukee, 17 Sep. 1979 Prepared jointly with Brookhaven Natl. Lab., Upton, N.Y.
(Contract EY-76-C-02-0016)
(BNL-26392; CONF-790910-1) Avail: NTIS HC A03/MF A01

Alloys based on the CsCl compound phase TiFe exhibit unusual hydrogen storage capacity. Improvements of these properties were pursued by alloying in which the CsCl structure is retained. The conditions under which that can be accomplished can only be predicted if the ternary phase diagram X-Ti-Fe is known. The present paper illustrates iterative computation of the Al-Ti-Fe and Mn-Ti-Fe ternary systems synthesized from the component edge binaries which were previously characterized by the CALPHAD group. The first computations were checked experimentally and it was found that the Mn-Ti-Fe exhibited good predictability while Al-Ti-Fe did not. Thus a second computation of Al-Ti-Fe was carried out. The initial success of the Mn-Ti-Fe computation and failure of the Al-Ti-Fe calculation depended upon prediction of the trajectory of stable propagation of the TiFe-CsCl phase into the TiFe-X ternary system. DOE

N80-16154# Brookhaven National Lab., Upton, N. Y. Dept. of Nuclear Energy.
EROSION-CORROSION
B. Vyas 1979 81 p refs
(Contract EY-76-C-02-0016)
(BNL-24884) Avail: NTIS HC A05/MF A01

Various interactions between the chemical and mechanical agents leading to accelerated degradation of materials are presented in order to arrive at a better understanding of the process involved in the accelerated rate of material loss under erosion-corrosion conditions. DOE

N80-16155# Rockwell International Corp., Golden, Colo. Rocky Flats Plant.
EVALUATION OF METHODS FOR CLEANING LOW CARBON URANIUM METAL AND ALLOY SAMPLES
K. Kirchner and M. Dixon 5 Jul. 1979 5 p refs
(Contract EY-76-C-04-3533)
(RFP-2793) Avail: NTIS HC A02/MF A01

Several methods for cleaning uranium samples prior to carbon analysis, using a carbon analyzer, were evaluated. Use of a concentrated aqueous detergent followed by water and acetone rinse was found to be the best overall technique. DOE

N80-16156# Hanford Engineering Development Lab., Richland, Wash.
INFLUENCE OF HEAT TREATMENT ON THE MICROSTRUCTURE AND MECHANICAL PROPERTIES OF ALLOY 718 BASE METAL AND WELDMENTS
W. J. Mills Jun. 1979 121 p refs
(Contract EY-76-C-14-2170)
(HEDL-TME-78-54) Avail: NTIS HC A06/MF A01

Light microscopy, thin foil, and surface replica electron microscopy revealed that the microstructure of this superalloy was sensitive to heat treatment and heat-to-heat variations. Use of a modified aging treatment resulted in a larger grain size and a more homogeneous microstructure than the conventional treatments. The morphology of the primary strengthening gamma phase was found to be finer and more closely spaced in the conventionally treated condition. Room and elevated temperature tensile testing revealed that the strength of the conventionally treated alloy was generally superior to that of the modified material. The modified aging treatment reduced the amount of Laves phase present in the weld zone. Room and elevated temperature tensile properties of the precipitation hardened weldments were relatively insensitive to heat treatment, suggesting that reduction in Laves phase from the weld zone had essentially no effect on tensile properties. As-welded GTA weldments exhibited lower strength levels and higher ductility values than heat-treated welds. DOE

N80-16157# California Univ., Berkeley. Lawrence Berkeley Lab.
COMPUTER SIMULATION OF THE MARTENSITE TRANSFORMATION IN A MODEL TWO-DIMENSIONAL BODY
S. Chen, A. G. Khachaturyan, and J. W. Morris, Jr. May 1979 7 p refs Presented at Intern. Conf. on Martensitic Transformation, Boston, 24 Jun. 1979
(Contract W-7405-eng-48)
(LBL-9346; CONF-7906103-1) Avail: NTIS HC A02/MF A01

An analytical model of a martensitic transformation in an idealized body is constructed and used to carry out a computer simulation of the transformation in a pseudo-two-dimensional crystal. The reaction is assumed to proceed through the sequential transformation of elementary volumes (elementary martensitic particles, EMP) via the Bain strain. The elastic interaction between these volumes is computed and the transformation path chosen so as to minimize the total free energy. The model transformation shows interesting qualitative correspondencies with the known features of martensitic transformations in typical solids. DOE

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N80-16158* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CRYSTALLINE POLYIMIDES Patent
Terry L. St.Clair and Anne K. St.Clair, inventors (to NASA) Issued 25 Dec. 1979 4 p Filed 15 May 1978 Supersedes N78-24360 (16 - 15, p 1975)
(NASA-Case-LAR-12099-1; US-Patent-4,180,648; US-Patent-Appl-SN-906299; US-Patent-Class-528-207; US-Patent-Class-528-208) Avail: US Patent and Trademark Office CSCL 07C

Aromatic crystalline polyimides are disclosed that are synthesized from polyamide-acid and when heated to 200 C to 300 C become cyclized to afford an opaque polymer. X-ray diffraction of the unoriented film exhibited 47 percent crystallinity. Differential scanning calorimetry reveals a melt at 425 C with no glass transition in these crystalline polyimides.
Official Gazette of the U.S. Patent and Trademark Office

N80-16159 American Univ., Washington, D. C.
A STUDY OF THE PHOTODEGRADATION OF POLY (METHYL METHACRYLATE) Ph.D. Thesis
Mohamed Abouelezz 1979 105 p
Avail: Univ. Microfilms Order No. 8000749

A study was performed in order to examine the effects on the polymer of radiation from the ultraviolet, the visible, and the infrared regions of the spectrum and to identify the mechanism(s) of degradation induced by the radiation. It was concluded that a different or more complex mechanism is operative in the photodegradation of poly (methyl methacrylate) at increasing wavelengths of incident radiation than that proposed for irradiation with a 253.7 nm source. A combination of mechanism (e.g., combination unzipping superimposed on random scission) is probably operating at the higher wavelengths. Dissert. Abstr.

N80-16160 Case Western Reserve Univ., Cleveland, Ohio.
TRANSPORT PROPERTIES OF CHLOROSULFONATED BLOCK COPOLYMERS Ph.D. Thesis
Hoo Young Chung 1979 170 p
Avail: Univ. Microfilms Order No. 8001453

The sorption and diffusion behavior of water and dynamic mechanical properties under various humidities were determined

using solution chlorosulfonated ABA block copolymers (A = polystyrene; B = polyethylene-butene-1), a specially prepared sample of polyethylene-butene-1) comparable to the B midblock, and their subsequently ionized forms. The extent of chlorosulfonation, analyzed by X-ray fluorescence, ranged from zero to eight percent sulfur. The results are interpreted in terms of a model involving formation of dipole-dipole aggregates within the non polar hydrocarbon matrix. The formation of glassy polystyrene domains, which competes with polar aggregates, was found tc have a profound effect on water sorption as well as dynamic mechanical properties. Dissert. Abstr.

N80-16161 American Univ., Washington, D. C.
AN OPTICAL INVESTIGATION OF THE CORRELATION BETWEEN MASS TRANSPORT AND MECHANICAL PROPERTIES OF STRAINED POLYMER FILMS Ph.D. Thesis
Joseph Cornelius Phillips 1979 165 p
Avail: Univ. Microfilms Order No. 8000762

The transport and mechanical relaxation behavior of low density polyethylene and polyvinylidene fluoride (PVF2) in ethyl acetate vapor were extensively investigated at 30 C for a range of strain levels and vapor pressures. Polyethylene in ethyl acetate vapor was found to exhibit conventional diffusion while PVF2 above its glass transition temperat rre of -38 C was found to exhibit Type II diffusion above a transition pressure, p, and conventional diffusion below p. These results tend to show that morphology, elastic and plastic deformations, and mechanical relaxation influence both conventional and nonconventional transport properties and that Type II diffusion may occur for polymer/vapor systems above the glass transition temperature. Dissert. Abstr.

N80-16162 Detroit Univ., Mich.
THERMAL STABILITY OF ISOCYANATE BASED POLYMERS Ph.D. Thesis
Panagiotis I. Kordomenos 1978 226 p
Avail: Univ. Microfilms Order No. 7922254

The thermal behavior of model compounds, as well as model polymers were examined. The kinetics of the initial stage of the decomposition of the model compounds (cleavage of urethane group, oxazolidone and isocyanurate rings) was measured by using an IR-ampoule technique that was developed for this purpose. The decomposition products of model oxazolidone and model isocyanurate compounds were analyzed. The thermal degradation of the model polymers was investigated by means of dynamic and isothermal TGA. It was found that comparative studies of the kinetics of decomposition of model compounds (where the kinetics of the selective cleavage of key groups is monitored) with the isothermal TGA measurements of the model polymer represent a new methodology suitable for the estimation of the thermal limits (weakest points) of the complex polymer molecules. Dissert. Abstr.

N80-16163*# National Aeronautics and Space Administration. Pasadena Office, Calif.
STRONG THIN MEMBRANE STRUCTURE Patent Application
Robert E. Frazer, inventor (to NASA) (JPL) Filed 21 Dec. 1979 24 p
(Contract NAS7-100)
(NASA-Case-NPO-14021-2; US-Patent-Appl-SN-106188) Avail: NTIS HC A02/MF A01 CSCL 11D

A continuous process is described for producing strong lightweight structures for use as solar sails for spacecraft propulsion by radiation pressure. A thin reflective coating, such as aluminum, is applied to a rotating cylinder. A nylon mesh, applied over the aluminum coating, is then coated with a polymerizing material such as a para-xylylene monomer gas to polymerize as a film bound to the mesh and the aluminum. An emissivity increasing material such as chromium or silicon monoxide is applied to the polymer film to disperse such material colloidally into the growing polymer film, or to the final polymer film. The resulting membrane structure is then removed from the cylinder. Alternately, the membrane structure can be formed by etching a substrate in the form of an organic film such as a polymide, or a metal foil, to remove material from the substrate and reduce its thickness. A thin reflective coating (aluminum) is applied on one side of the substrate, and an emissivity increasing coating is applied on the reverse side of the substrate. NASA

N80-16164*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ALUMINUM ION-CONTAINING POLYIMIDE ADHESIVES Patent Application
Anne K. St.Clair (Old Dominion Univ., Norfolk, Va.), Terry L. St.Clair (Old Dominion Univ., Norfolk, Va.), and Larry T. Taylor, inventors (to NASA) (Old Dominion Univ., Norfolk, Va.) Filed 7 Nov. 1979 14 p Sponsored by NASA
(NASA-Case-LAR-12640-1; US-Patent-Appl-SN-092142) Avail: NTIS HC A02/MF A01 CSCL 11I

A method is described for preparing an aluminum ion-filled polyimide adhesive. A meta-oriented aromatic diamine is reacted with an aromatic dianhydride and an aluminum compound in the presence of a water or lower alkanol miscible ether solvent to produce an intermediate polyamic acid. The polyamic acid is converted to the thermally stable, metal ion-filled polyimide by heating in the temperature range of 300 C to produce a flexible, high temperature adhesive. NASA

N80-16165*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MECHANISMS OF LUBRICATION AND WEAR OF A BONDED SOLID LUBRICANT FILM
Robert L. Fusaro 1980 40 p refs Proposed for presentation at 35th Ann. Meeting of the Am. Soc. of Lubrication Engr., Anaheim, Calif., 5-8 May 1980
(NASA-TM-81396; E-296) Avail: NTIS HC A03/MF A01 CSCL 11H

To obtain a better understanding of how bonded solid lubricant films lubricate and wear (in general), the tribological properties of polyimide-bonded graphite fluoride films were studied (in specific). A pin-on-disk type of testing apparatus was used; but in addition to sliding a hemispherically tipped rider, a rider with a 0.95 mm diameter flat area was slid against the film. This was done so that a lower, less variable contact stress could be achieved. Two stages of lubrication occurred. In the first, the film supported the load. The lubricating mechanism consisted of the shear of a thin surface layer (of the film) between the rider and the bulk of the film. The second occurred after the bonded film had worn to the substrate, and consisted of the shear of very thin lubricant films between the rider and flat plateaus generated on the metallic substrate asperities. The film wear mechanism was strongly dependent on contact stress. M.M.M.

N80-16166*# Idaho Univ., Moscow. Dept. of Chemical Engineering.
PERFLUROETHER TRIAZINE ELASTOMERS Final Report, 1 Mar. 1979 - 29 Feb. 1980
Roger A. Korus 1980 25 p refs
(Grant NsG-2367)
(NASA-CR-162748) Avail: NTIS HC A02/MF A01 CSCL 06C

In order to obtain high performance elastomers with the high thermal stability and chemical inertness of perfluoroalkylene triazine and a low glass transition temperature, perfluoroether triazine elastomers were synthesized. The procedure for elastomer synthesis is described as well as general experimental methods. Results are presented and discussed. The screening of catalysts for the dehydration of perfluoroether diamide is also considered. A.R.H.

N80-16167# Firestone Tire and Rubber Co., Akron, Ohio. Central Research Labs.
PHOSPHONITRILIC FLUOROELASTOMER COATED FABRICS FOR COLLAPSIBLE FUEL STORAGE TANKS Final Report, 1 Feb. 1978 - 30 Mar. 1979
Richard W. Sicka and George B. Mitchell Jul. 1979 78 p refs
(Contract DAAG46-78-C-0006; DA Proj. 1L1-63102-D-071) (AD-A074824; AMMRC-TR-79-44) Avail: NTIS HC A04/MF A01 CSCL 13/4

This report describes the preparation of fuel resistant coated fabric materials that are serviceable at temperatures as low as -70 F. The coated fabric materials were made from a phosphonitrilic fluoroelastomer compound coated on nylon fabric. Efforts

were directed toward attainment of calenderable compounds and test evaluations of the coated fabric. High filler loaded materials proved to be better processable materials. These showed good diffusion rates with test fluids (TT-S-735, Type II and Fuel S). Even better diffusion rates were seen with Arctic diesel fuel. The low temperature flexibility of the vulcanizates and coated fabric was promising for PNF-200 compounds. The seam adhesion strength and the fabric-to-rubber adhesion need to be improved before utilization of this material in tank constructions. GRA

N80-16168# Stanford Univ., Calif. Div. of Applied Mechanics.
ON HARMONIC MOTION OF SANDWICH PLATES Interim Report
G. Herrmann and G. S. Beaupre Jun. 1979 21 p refs
(Contract N00014-76-C-0054)
(AD-A074637; SUDAM-79-2) Avail: NTIS HC A02/MF A01 CSCL 13/11

Horizontally polarized shear motion in symmetric sandwich plates is considered. It is shown that certain Floquet-type solutions describing such motion in an infinite, periodically layered, elastic composite describe the same motion. GRA

N80-16169# Bendix Corp., Kansas City, Kans. Communications Services.
TESTING THE INTERLAMINATE ADHESION OF MULTILAYER PRINTED WIRING BOARDS
J. W. Lula Sep. 1978 15 p ref
(Contract EY-76-C-04-0613)
(BDX-613-2011) Avail: NTIS HC A02/MF A01

Thermochemical analysis (TMA) was used to evaluate lamination cure cycles, inner layer surface preparation, prepreg conditioning techniques, and other process variables affecting the interlaminate adhesion of multilayer printed wiring boards. Because of its simplicity, TMA was also used as a production quality control test. DOE

N80-16170# Bendix Corp., Kansas City, Kans. Communication Services.
POLYURETHANE FOAM, 0.05 g/cm3 DENSITY Final Report
J. R. Fender Oct. 1978 17 p refs
(Contract EY-76-C-04-0613)
(BDX-613-1964-Rev) Avail: NTIS HC A02/MF A01

A process developed to meter and mix Rigifoam 6003-2 material on an automatic mixing machine gave a substantially improved yield over the batch-mixing process used in initial development work. It was shown that this process meets the necessary requirements for a high production yield. Previous evaluation of the Bendix Rigifoam 6003-2 foam system is discussed, as well as continued dimensional studies, long-term aging of material, and machine metering and mixing. DOE

N80-16171# California Univ., Livermore. Lawrence Livermore Lab.
CHARACTERIZATION OF HALTHANE POLYURETHANE ADHESIVES. 1: DYNAMIC MECHANICAL AND THERMAL PROPERTIES
D. Mark Hoffman Jun. 1979 26 p refs Presented at DOE Weapons Complex Ann. Adhesives Conf., Amarillo, Tex., 5 Jun. 1979
(Contract W-7405-eng-48)
(UCRL-82694; CONF-790668-2) Avail: NTIS HC A03/MF A01

The polyurethanes presented contain polyether-isocyanate soft segments that exhibit a low temperature secondary relaxation at 150 C. The lower molecular weight polyether isocyanate soft segments of 73 series adhesives have higher glass transition temperatures (-50 C) than the higher molecular weight polyether-isocyanate soft segments of 87 and 88 series adhesives (-70 C). The 73 series polyurethanes also show a weak peak in the loss modulus at about 100 C. The relaxation strength of the soft segment glass transition depends on the molecular structure of the hard segments. Chemically different hard segments produce adhesives with different shear storage modulus over the temperature range (5 x 10 to the 8th power Pa for 88 and 87 series adhesives and about 1 x 10 to the 6th power Pa for 73 series adhesives). DOE

N80-16172# Case Western Reserve Univ., Cleveland, Ohio.
POLYMER MATERIALS BASIC RESEARCH NEEDS FOR ENERGY APPLICATIONS. PROCEEDINGS OF A WORKSHOP RECOMMENDING FUTURE DIRECTIONS IN ENERGY-RELATED POLYMER RESEARCH
W. J. Macknight, E. Baer, and R. D. Nelson Aug. 1979 205 p refs Workshop held at Cleveland, 27-29 Jun. 1978 Sponsored by DOE and Massachusetts Univ.
(CONF-780643) Avail: NTIS HC A10/MF A01

The larger field covered in the workshop consists of (1) synthesis and characterization, (2) physical chemistry, (3) physics, and (4) engineering. The basic research needs in polymer materials related to energy are reported. The development of sophisticated instrumentation makes the task of molecular characterization possible on a level hitherto unattainable. Many of these instruments because of their size and complexity must of necessity be located at the DOE National Laboratories. The importance of personnel trained in the polymer field located at these facilities is emphasized. In the past there has been relatively little concerted polymer research within the energy community. This report attempts to describe the present situation and point out some needs and future research directions. DOE

N80-16173# California Univ., Berkeley. Lawrence Berkeley Lab.
LIGHT SCATTERING STUDIES OF SOLIDS AND ATOMIC VAPORS Ph.D. Thesis
T. C. Chiang Sep. 1978 132 p refs
(Contract W-7405-eng-48)
(LBL-8222) Avail: NTIS HC A07/MF A01

Topics covered include: (1) multi-phonon resonant Raman scattering up to four phonons in GaSe and one- and two-phonon resonant Raman scattering in the mixed GaS/sub x/Se/sub 1-x/ crystals with x < or = 0.23; (2) one-phonon resonant Raman scattering in HfS2; (3) excitonic transition in antiferromagnetic MnF2; (4) two-magnon resonant Raman scattering in MnF2 around the magnon sideband; (5) a theory of exciton-exciton interaction in MnF2; (6) independent elastic constants of the layered compound GaSe; and (7) two-photon parametric scattering in sodium vapor. DOE

N80-16174# Steel Structures Painting Council, Pittsburgh, Pa.
PERFORMANCE OF ALTERNATE COATINGS IN THE ENVIRONMENT (PACE) Final Report
Joseph A. Bruno, John Keane, and Raymond E. F. Weaver 30 May 1979 245 p refs Sponsored in part by DOE Pennsylvania Dept. of Transportation, Harrisburg; American Iron and Steel Inst.; Federation of Societies for Coating Technology; Steel Plate Fabricators Association; and Naval Civil Engineering Labs.
(PB-300868/7; FHWA/PA-79/05) Avail: NTIS HC A11/MF A01 CSCL 11C

Anti-corrosion coatings and methods developed to meet environmental needs were selected by a consensus committee evaluated in five environments in comparison with a range of standard materials whose long-term performance had been established. Periodic evaluations show that none of the alternative pigmentations were superior to the red lead or chromate controls in conventional oil or alkyd vehicles, although several were promising. In various vinyl vehicles, however, these alternative pigments, including some inerts, are at least equal to red lead, probably due to an encapsulating effect. GRA

N80-16221*# Cambridge Acoustical Associates, Inc., Mass.
THE EFFECTS OF FREQUENCY, AMPLITUDE, AND LOAD ON THE DYNAMIC PROPERTIES OF ELASTOMERS
John E. Cole, III *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 105-117 refs
(For primary document see N80-16211 07-31)
(Contract N00014-69-C-0056)
Avail: NTIS HC A10/MF A01 CSCL 11G

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N80-16175 Stanford Univ., Calif.
AUTOHYDROLYSIS FOR IMPROVING METHANE YIELD FROM FERMENTATION OF LIGNOCELLULOSE Ph.D. Thesis
William Frederick Owen 1979 209 p
Avail: Univ. Microfilms Order No. 8001985

Aqueous heat treatment without chemical addition (autohydrolysis) was invcstigated as a pretreatment method for physically separating lignocellulose constituents from the matrix, in order to improve bioconversion efficiency to methane in anaerobic fermentation systems. Oxidative and nonoxidative autohydrolysis treatments ranging from 150 to 250 C were evaluated for relative effect on representative complex lignocellulosics (white fir, corn stover, and bagasse) and individual components of lignocellulose (cellulose, hemicellulose, and lignin). Preliminary studies using peat and newsprint indicated that bioconversion efficiency could be improved by autohydrolysis pretreatment, but autohydrolysis decreased the bioconversion efficiency of agricultural residues which were relatively biodegradable before treatment. It is proposed that autohydrolysis treatment be limited to nonbiodegradable lignocellulosics such as woody residues or previously digested materials. Dissert. Abstr.

N80-16176 Brigham Young Univ., Provo, Utah.
THEORETICAL MODELING OF COAL AND GAS FIRED TURBULENT COMBUSTION AND GASIFICATION PROCESSES Ph.D. Thesis
Philip John Smith 1979 511 p
Avail: Univ. Microfilms Order No. 8000091

A one-dimensional computer code was developed for the analysis of pulverized coal combustors and entrained flow gasifiers. Emphasis was placed on the description of the coal reaction processes and the gas-particle interactions. An Adams-Moulton, predictor-corrector solution technique was successfully implemented in solving the differential equations involved in the system. A number of predictions have been made for different combustors and gasifiers operating under a variety of conditions. An axi-symmetric two dimensional computer code was developed for the analysis of turbulent gaseous fired diffusion flames and as a basis for coal fired systems. The combustion model uses local instantaneous complex chemical equilibrium. A probability density function approach is used to obtain mean gas phase properties. A number of predictions were made for both nonreacting and reacting flow systems. Dissert. Abstr.

N80-16177# National Academy of Sciences - National Research Council, Washington, D. C. Energy Engineering Board.
HYDROGEN AS A FUEL
1979 86 p refs
(Contract EY-76-C-02-2708)
Avail: NTIS HC A05/MF A01

A panel of the Committee on Advanced Energy Storage Systems of the Assembly of Engineering examined the status and problems of hydrogen manufacturing methods, hydrogen transmission and distribution networks, and hydrogen storage systems. Suitable criteria for establishing the pace, timing, and technical content of appropriate federally sponsored hydrogen R&D programs was considered. It was concluded the increasing urgency to develop new sources and forms of fuel and energy may well impact on the scale and timing of potential future hydrogen uses. M.M.M.

N80-16178# California Univ., Berkeley. Lawrence Berkeley Lab.
AGGREGATED VECTORIAL MODEL OF PETROLEUM FLOW IN THE UNITED STATES
V. V. Krishnan and D. F. Cahn Mar. 1979 90 p refs
(Contract W-7405-eng-48)
(LBL-8874) Avail: NTIS HC A05/MF A01

An aggregated material-flow model is proposed for crude oil and its derivative products. Stages in petroleum flow where material conservation is expected are isolated from those where volumetric or identity changes can occur, and generic properties of petroleum and petroleum products that would assist in effective data validation are identified. The model provides a structural framework for organization and consolidation of the various data bases related to petroleum, and serves as a guide for analysis and enumeration of explicit semantic data interrelationships. The model is amenable to expansion into both transactional and more disaggregated representations. The material-flow model is intended as a preliminary step toward a coherent and comprehensive data structure to support monitoring, forecasting, and regulatory efforts in the energy field. The model is developed in the abstract; no attempt is made to test it using explicit data. DOE

N80-16179# Brookhaven National Lab., Upton, N. Y.
PRELIMINARY ASSESSMENT OF THE PROSPECTS FOR USE OF REFUSE-DERIVED FUEL IN MARYLAND
W. C. Metz and J. Shyar Feb. 1979 82 p refs
(Contract EY-76-C-02-0016)
(BNL-51065) Avail: NTIS HC A05/MF A01

The deployment problems of refuse derived fuel (RDF) production in Maryland are examined. Problems experienced by the pyrolysis plant in Baltimore City and the resource recovery plant in Baltimore County are cited. Maryland's municipal solid waste problems are discussed with emphasis on the major components of the municipal solid waste stream, e.g., volume, composition, and location; collection methods used; present and long-range disposal methods; and regulations and ordinances. The generic social and legal constraints to RDF production are described. The problems of RDF technology deployment in Maryland, i.e., county and state RDF energy potential, institutional barriers to RDF production and use, remitting requirements for new RDF production and use facilities, water quality issues of RDF production and use, air quality issues of RDF production and use, and recommendations for initiating RDF production and use are discussed. DOE

N80-16180# California Univ., Livermore. Lawrence Livermore Lab.
CHEMICAL KINETICS IN LNG DETONATIONS
C. K. Westbrook and L. C. Haselman 14 Sep. 1979 27 p refs Presented at 7th Intern. Colloq. on Gas-Dynamics of Explosions and Reactive Systems, Gottingen, West Germany, 20 Aug. 1979 Revised
(Contract W-7405-eng-48)
(UCRL-82293-Rev-1; CONF-790828-1-Rev-1) Avail: NTIS HC A03/MF A01

The problem of detonability of vaporized mixtures of liquified natural gas and air is addressed, using a characteristic time analysis. Separate numerical models are used to treat the evolution of the blast wave produced by a charge of high explosive and the chemical ignition delay of the fuel-air mixture. These models are combined with experimental data to predict the amount of high explosive required to initiate a detonation of a stoichiometric mixture of methane and air, giving an estimate of 50 to 100 kg of high explosive in spherical geometry. The effects of minor constituents such as ethane and propane on methane-air detonability are examined, and the mechanism by which these minor constituents kinetically sensitize the fuel is discussed.DOE

N80-16181# Department of Energy, Morgantown, W. Va. Energy Technology Center.
UNCONVENTIONAL GAS RECOVERY PROGRAM Semiannual Report, 31 Mar. 1979
R. L. Wise, ed. Aug. 1979 375 p
(METC/SP-79/8) Avail: NTIS HC A16/MF A01

Progress of projects directed at gas recovery from unconventional sources is reported. Methane recovery from coalbeds, eastern gas shales, western gas sand, and geopressured aquifers are among the topics covered. DOE

N80-16182# Badger Plants, Inc., Cambridge, Mass.
CONCEPTUAL DESIGN OF A COAL-TO-METHANOL-TO-GASOLINE COMMERCIAL PLANT: EXECUTIVE SUMMARY Interim Final Report, 31 Aug. 1977 - 31 Mar. 1979
Mar. 1979 53 p

(Contract EX-76-C-02-2416)
(FE-2416-43; IFR-2) Avail: NTIS HC A04/MF A01

An engineering and economic assessment of a conceptual design for a commercial facility to convert coal-to-methanol-to-gasoline is presented. This design is conceptual and, therefore, is considered to be a prediction of the development of the technology in question and thus appropriate for comparative economic evaluation purposes. DOE

N80-16183# Department of Energy, Washington, D. C. Div. of Coal Conversion.
COAL LIQUEFACTION Quarterly Report, Jul. - Sep. 1978
May 1979 65 p
(Contract EX-76-C-01-2297)
(DOE/ET-0068/3) Avail: NTIS HC A04/MF A01

Several conversion processes that are currently in the pilot plant stage are described briefly and information is given as to contractor, contract, funding, site, and current progress. Several support projects are also described. DOE

N80-16184# Department of Energy, Washington, D. C. Div. of Coal Conversion.
COAL GASIFICATION Quarterly Report, Jul. - Sep. 1978
May 1979 77 p
(Contract EY-76-C-01-2297)
(DOE/ET-0067/3) Avail: NTIS HC A05/MF A01

A number of processes for making high Btu gas and for making low Btu gas are described with the contractor identification, contract, site, funding, and current progress. Projects on mathematical modeling and preparation of a coal conversion systems technical data book are also described. DOE

N80-16185# Brookhaven National Lab., Upton, N. Y.
FLASH HYDROPYROLYSIS OF COAL Progress Report, 1 Jul. - 31 Dec. 1978
M. Steinberg and P. Fallon Feb. 1979 156 p
(Contract EY-76-C-02-0016)
(BNL-51010; PR-7) Avail: NTIS HC A08/MF A01

The data generated by the parametric study of lignite was correlated and activation energies for a first approximation of the reaction scheme are presented. These range from 88 Kcal/mol for the formation of ethane and 62 Kcal/mol for the formation of benzene to 29 Kcal/mol for the formation of methane, all from the feed coal. The mechanism appears to be largely chemical reaction rate controlled as opposed to diffusion controlled. DOE

N80-16186# Los Alamos Scientific Lab., N. Mex.
ASSESSMENT OF ENVIRONMENTAL AND SAFETY PROBLEMS IN HYDROGEN ENERGY SYSTEMS
F. J. Edeskuty, J. R. Bartlit, and R. V. Carlson 1979 5 p refs
Presented at the Intern. Congress on Refrigeration, Venice, 23 Sep. 1979
(Contract W-7405-eng-36)
(LA-UR-79-583; CONF-790901-3) Avail: NTIS HC A02/MF A01

Safety problems associated with the use of hydrogen as a portable or transportable fuel are discussed along with mechanisms to ensure the proper design of equipment and techniques for its storage, shipment, and use. The most likely methods of shipment are gas transmission by pipeline and bulk transportation of hydrogen as a cryogenic liquid. While these are well developed, safety and technological problems still exist and include such issues as dispersion of hydrogen releases, behavior of hydrogen on combustion, and hydrogen embrittlement. Safe transportation and handling of hydrogen can be enhanced by uniformity of codes and regulations. Hydrogen use as a fuel is not totally benign from an environmental standpoint; however, the combination of production and end use is generally more acceptable for hydrogen than for alternative fuels. DOE

N80-16187# Gruy Federal, Inc., Arlington, Va.
OIL AND GAS REPLACEMENT COST: DEVELOPMENT AND PRODUCTION. VOLUME 1: DISCUSSION OF METHODOLOGY, EXHIBITS, AND PROJECTIONS Final Report
5 Aug. 1977 112 p Sponsored by DOE
(DOE/TIC-10078) Avail: NTIS HC A06/MF A01

Oil and Gas Development and production costs are projected by region and depth interval for the benchmark years 1980, 1985 and 1990. Twenty-four geographical regions were specified and six depth classes defined under historical development costs. Direct operating costs are also covered. DOE

N80-16188# Los Alamos Scientific Lab., N. Mex.
ESTIMATION OF THE DENSITY OF ORGANIC EXPLOSIVES FROM THEIR STRUCTURAL FORMULAS
H. H. Cady Aug. 1979 23 p refs
(Contract W-7405-eng-36)
(LA-7760-MS) Avail: NTIS HC A02/MF A01

A technique for predicting the density of an organic (C-H-N-O-Cl-F) compound given its proposed structural formula is presented. DOE

N80-16189# Gorham International, Inc., Maine.
ASSESSMENT OF THE TECHNICAL AND ECONOMIC FEASIBILITY OF CONVERTING WOOD RESIDUES TO LIQUID AND GASEOUS FUEL PRODUCTS USING STATE-OF-THE-ART AND ADVANCED COAL CONVERSION TECHNOLOGY Quarterly Report, 1 Dec. 1978 - 28 Feb. 1979
May 1979 15 p refs
(Contract ET-78-C-02-4862)
(COO-4862-3; QR-3) Avail: NTIS HC A02/MF A01

The approach to be used in evaluating coal gasification technologies for gasification of wood is outlined. The coal gasification technologies to be evaluated and their status are tabulated. The parameters critical to the development of wood gasification (technical risk, economics, institutional factors, and environmental impacts) are briefly discussed. DOE

N80-16190# Mobil Research and Development Corp., Paulsboro, N. J.
DEVELOPMENT STUDIES ON SELECTED CONVERSION OF SYNTHESIS GAS FROM COAL TO HIGH OCTANE GASOLINE Final Report
J. A. Brennan Oct. 1978 383 p refs
(Contract EX-76-C-01-2276)
(FE-2276-27) Avail: NTIS HC A17/MF A01

An exploratory, experimental process study was conducted on the direct conversion of coal derived synthesis gas to gasoline. Novel, proprietary catalysts were used; (these unique catalysts do not yield oxygenates and the hydrocarbons formed are limited in size to about C sub 11.) This new technology was compared with conventional Fischer-Tropsch. The experiments were conducted in micro reactor (10 cc catalyst capacity) and in bench-scale units (150 cc catalyst capacity). The bench-scale unit was used in both a fixed and fluid bed mode. The studies included effects of temperature, pressure and space velocity on catalyst performance, and catalyst activation, aging and regeneration. DOE

N80-16191# Los Alamos Scientific Lab., N. Mex.
FIBER-REINFORCED PLASTIC-BONDED EXPLOSIVES
A. P. Torres and A. S. Vigil Oct. 1978 42 p refs
(Contract W-7405-eng-36)
(LA-7522-MS) Avail: NTIS HC A03/MF A01

Fiber reinforcement in plastic-bonded explosives was studied to determine the ability of fiber reinforcement to reduce munition main charge cracking under a severe thermal cycle. Two fiber reinforced plastic-bonded explosives, X-0308 (95 wt% RDX, 4.5 wt% Estane, 0.5 wt% polyethylene fibers) and X-0312 (95 wt% RDX, 3.5 wt% Estane, 1.5 wt% polyethylene fibers), were evaluated and compared against their nonfiber-reinforced homolog, X-0280 (95 wt% RDX, 5 wt% Estane). A thermal stress analysis was performed using TSAAS, a two-dimensional, finite element thermal and stress analysis code. Predictions corresponded closely with experimental results. The study demonstrated that fiber incorporation above 0.5 wt% did not improve resistance to cracking. DOE

N80-16192# Battelle Columbus Labs., Ohio.
PROCEEDINGS: SYMPOSIUM ON COAL CLEANING TO ACHIEVE ENERGY AND ENVIRONMENTAL GOALS HELD AT HOLLYWOOD, FLORIDA ON SEPTEMBER 1978, VOLUME 1 Final Report, Apr. 1977 - Mar. 1979
S. E. Rogers, ed. and A. W. Lemmon, Jr., ed. Apr. 1979 647 p refs

(Contract EPA-68-02-2163)
(PB-299383/0; EPA-600/7-79-098A) Avail: NTIS HC A99/MF A01 CSCL 07A

The physical and chemical coal cleaning programs of EPA, DOE, the Electric Power Research Institute, and numerous industrial organizations; European and Soviet plans for the future; and problems of ongoing operations are discussed. Topics are presented: coal characteristics, coal cleaning overview, and physical coal cleaning technology. GRA

N80-16193# Battelle Columbus Labs., Ohio.
PROCEEDINGS: SYMPOSIUM ON COAL CLEANING TO ACHIEVE ENERGY AND ENVIRONMENTAL GOALS HELD AT HOLLYWOOD, FLORIDA ON SEPTEMBER 1978, VOLUME 2 Final Report, Apr. 1977 - Mar. 1979
S. E. Rogers and A. W. Lemmon, Jr. Apr. 1979 595 p refs
(Contract EPA-68-02-2163)
(PB-299384/8; EPA-600/7-79-098B) Avail: NTIS HC A25/MF A01 CSCL 07A

A review and discussion is reported on: the physical and chemical coal cleaning programs of EPA, DOE, the Electric Power Research Institute, and numerous industrial organizations; European and Soviet plans for the future; and problems of ongoing operations. The following included are: environmental assessment and pollution control technology, and chemical coal cleaning technology. GRA

N80-16194# Office of Technology Assessment, Washington, D. C.
GASOHOL: A TECHNICAL MEMORANDUM
Sep. 1979 89 p refs
(PB80-105885; OTA/TM/E-1) Avail: NTIS HC A05/MF A01 CSCL 21D

The technical and non technical issues surrounding the development of gasohol are discussed including the resource base, production technologies, and economics of gasohol, and its use as a transportation fuel. The environmental problems and benefits of producing and using gasohol, and the social and institutional issues about using agricultural products for energy are covered. Policy options about gasohol as well as other bioenergy technologies such as wood and methanol production are considered. GRA

N80-16195# National Technical Information Service, Springfield, Va.
ALCOHOL FUELS. CITATIONS FROM THE AMERICAN PETROLEUM INSTITUTE DATA BASE Progress Report, 1973 - Jul. 1979
Diane M. Cavagnaro Sep. 1979 194 p
(NTIS/PS-79/0911/2) Avail: NTIS HC $28.00/MF $28.00 CSCL 21D

Research on alcohol fuels are cited. The citations cover synthesis, chemical analysis, performance testing, processing, pollution, economics, environmental effects, and feasibility. (Contains 178 abstracts). GRA

N80-16228*# Sandia Labs., Albuquerque, N. Mex.
A COMPUTATIONAL MODEL DESCRIBING THE INITIATION OF SILVER ACETYLIDE-SILVER NITRATE EXPLOSIVE BY AN INTENSE LIGHT SOURCE
Floyd H. Mathews *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 177-191 refs
Sponsored by DOE (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 19A

N80-16229*# Sandia Labs., Albuquerque, N. Mex.
TERMINAL VELOCITY AND ROTATION RATE OF A FLYER PLATE PROPELLED BY A TUBE-CONFINED EXPLOSIVE CHARGE
R. A. Benham *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 193-201 refs
(For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 19A

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N80-16196 California Univ., Berkeley.
VARIABLE MODULUS MODEL FOR INELASTIC FINITE ELEMENT ANALYSIS Ph.D. Thesis
Taha Daud Al-Shawaf 1979 141 p
Avail: Univ. Microfilms Order No. 8000269

A variable modulus modeling procedure for nonlinear analysis of soils is presented. The procedure accounts for stiffening behavior under volumetric strain, strain softening behavior under distortional strain, the influence of hydrostatic stress on shear strength, and the shear dilation effect. A numerical modeling process based on piecewise linear behavior (piecewise constant moduli) is used, without the use of analytical expressions for material properties. The modulus values are determined from the results of hydrostatic and triaxial tests. The theoretical basis of the method is presented, and the procedure for calculating the tangent moduli is described. Computational techniques for the state-determination problem and the linearization phase are developed and implemented in a general purpose computer program. Dissert. Abstr.

N80-16197# Naval Construction Battalion Center, Port Hueneme, Calif. Civil Engineering Lab.
SHRINKAGE-COMPENSATING CEMENT FOR AIRPORT PAVEMENT, PHASE 2
John R. Keeton Sep. 1979 42 p refs
(Contract DOT-FA75WAI-530)
(AD-A075739; FAA-RD-79-11; TN-1581) Avail: NTIS HC A03/MF A01 CSCL 11/2

Details of a research study on shrinkage-compensating concrete for airport pavements are presented. A total of 53 slab-type prisms 1 foot square and 8, 12, 16, or 20 inches thick were subjected to shrinkage, cooling, and heating. Concrete compressive stresses induced by expansion were calculated, as well as residual compressive stresses after losses due to shrinkage and cooling. The residual concrete compressive stresses, coupled with results from previous field applications of shrinkage-compensating concrete, are used as a basis for recommendation of transverse joint spacings up to 200 feet. Author

N80-16198*# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION BULLETIN. PART 1: INVITED PAPERS, VIBRATIONS AND ACOUSTICS, BLAST AND SHOCK
Sep. 1979 191 p refs Presented at the 49th Symp. on Shock and Vibration, Washington, D.C., 17-19 Oct. 1978
Sponsored by NASA, Goddard Space Flight Center 3 Vol.
(NASA-CR-162471; AD-A074699; Bull-49-Pt-1) Avail: NTIS HC A09/MF A01 CSCL 20K

Development in the modeling and simulation of shock and vibration phenomena are considered. Predicting the noise exposure of payloads in the space shuttle, prediction for step-stress fatigue, pyrotechnique shock simulation using metal-to-metal impact, and prediction of fragment velocities and trajectories are among the topics covered. For individual titles, see N80-16199 through N80-16210.

N80-16199*# Bolt, Beranek, and Newman, Inc., Canoga Park, Calif.
THE DEVELOPMENT OF A METHOD FOR PREDICTING THE NOISE EXPOSURE OF PAYLOADS IN THE SPACE SHUTTLE ORBITER VEHICLE c16
John F. Wilby and Larry D. Pope *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 5-30 refs Sponsored by NASA, Washington and SAMSO (For primary document see N80-16198 07-31)
(Contracts NAS5-22832; NAS9-15231)
Avail: NTIS HC A09/MF A01 CSCL 20A

The development of an analytical model for the prediction of sound levels in the payload bay of the space shuttle orbiter vehicle is outlined. Formulation of the analytical model and its validation by means of model scale and full scale tests are included. It is shown that the approach used in the development

effort has resulted in a prediction procedure which can be expected to give reliable estimates of payload bay sound levels, even when a payload is present. Furthermore, the analytical model has the capability of being readily modified to include other excitations such as turbulent boundary layers and propeller near-field pressures, and to other aerospace vehicles. J.M.S.

N80-16200*# General Electric Co., Utica, N. Y. Aircraft Equipment Div.

PROBABILITY OF FAILURE PREDICTION FOR STEP-STRESS FATIGUE UNDER SINE OR RANDOM STRESS **c39**

Ronald G. Lambert *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 31-41 refs (For primary document see N80-16198 07-31)
Avail: NTIS HC A09/MF A01 CSCL 20L

A previously proposed cumulative fatigue damage law is extended to predict the probability of failure or fatigue life for structural materials with S-N fatigue curves represented as a scatterband of failure points. The proposed law applies to structures subjected to sinusoidal or random stresses and includes the effect of initial crack (i.e., flaw) sizes. The corrected cycle ratio damage function is shown to have physical significance. Author

N80-16201*# Martin Marietta Corp., Denver, Colo.

ON THE USE OF COHERENCE FUNCTIONS TO EVALUATE SOURCES OF DYNAMIC EXCITATION **c39**

Stanley Barrett *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 43-58 refs (For primary document see N80-16198 07-31)
(Contract NAS1-14370)
Avail: NTIS HC A09/MF A01 CSCL 20K

The use of coherence functions for identifying the relative contributions of multiple dynamic inputs to the measured vibration response of spacecraft components on a practical, complex structure was investigated. Data were generated by applying simultaneous vibratory and acoustic excitation to a test model (a modified Titan instrumentation truss). Up to three inputs were used. In some cases mutually coherent inputs were generated. A digital computer program was written to analyze the test data, using an approach based on iterative computational algorithms. The results showed that the coherence function technique was effective in identifying and evaluating sources of excitation, for both independent and coherent inputs. The effect of varying the number of data samples used in the necessary averaging process was briefly investigated. J.M.S.

N80-16202*# Rockwell International Corp., El Segundo, Calif.

STATUS OF CAVITY NOISE PHENOMENA MEASUREMENT AND SUPPRESSION ON THE B-1 AIRCRAFT **c05**

A. G. Tipton and C. H. Hodson *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt 1 Sep. 1979 p 59-66 refs (For primary document see N80-16198 07-16)
Avail: NTIS HC A09/MF A01 CSCL 20A

During the B-1 aircraft development, an extensive program of weapons bay cavity noise measurement and suppression studies was performed using wind tunnel models, flight test measurements, and aircraft design modifications. Substantial cavity noise reduction was demonstrated during flight test operations. The unsuppressed cavity noise level of 170 dB was reduced to values less than 150 dB with external retractable spoilers upstream of the cavity opening. J.M.S.

N80-16203*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SPACE SHUTTLE SOLID ROCKET BOOSTER AFT SKIRT REENTRY NOISE INDUCED BY AN AERODYNAMIC CAVITY-FLOW INTERACTION **c16**

L. A. Schutzenhofer, P. W. Howard, W. W. Clever, and S. H. Guest *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 67-82 refs (For primary document see N80-16198 07-31)
Avail: NTIS HC A09/MF A01 CSCL 20A

High amplitude discrete frequency cavity induced noise was observed during wind tunnel testing of the reentry flight phase conditions of the solid rocket booster (SRB) of the space shuttle vehicle system. These wind tunnel tests were designed to acquire aerodynamic noise data for the development of vibroacoustic design and qualification test criteria for the SRB. The reentry trajectory characteristics of the SRB are random with the angle of attack varying from approximately 96 deg to 180 deg and with the dynamic pressure varying from approximately 360 to 1,020 lb/sq ft for a 95 percentile envelope for a Mach number of 3.5. The SRB model was a 2.8 percent scale model with all the external protuberances. It was tested with internal motor volumes of 5, 50, and 100 percent of the burnt-out SRB motor volume. Results of tests are given for two cavity volumes, i.e., 5 and 100 percent. Author

N80-16204*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SNAPS IN STRUCTURES **c39**

Michail Zak *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 83-87 refs (For primary document see N80-16198 07-31)
(Contract NAS7-100)
Avail: NTIS HC A09/MF A01 CSCL 20K

Snaps as a type of shock phenomena which arise in structures employing films, or strings are studied. The sources and the variety of such snaps are defined and a new mathematical model for their investigation is presented. Author

N80-16205*# SRI International Corp., Menlo Park, Calif.

A SIMPLIFIED METHOD OF EVALUATING THE STRESS WAVE ENVIRONMENT OF INTERNAL EQUIPMENT **c39**

J. D. Colton and T. P. Desmond *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 89-96 refs (For primary document see N80-16198 07-31)
Avail: NTIS HC A09/MF A01 CSCL 20K

A simplified method called the transfer function technique (TFT) was devised for evaluating the stress wave environment in a structure containing internal equipment. The TFT consists of following the initial in-plane stress wave that propagates through a structure subjected to a dynamic load and characterizing how the wave is altered as it is transmitted through intersections of structural members. As a basis for evaluating the TFT, impact experiments and detailed stress wave analyses were performed for structures with two or three, or more members. Transfer functions that relate the wave transmitted through an intersection to the incident wave were deduced from the predicted wave response. By sequentially applying these transfer functions to a structure with several intersections, it was found that the environment produced by the initial stress wave propagating through the structure can be approximated well. The TFT can be used as a design tool or as an analytical tool to determine whether a more detailed wave analysis is warranted. R.E.S.

N80-16206*# Motorola, Inc., Scottsdale, Ariz. Government Electronics Div.

HIGH G PYROTECHNIC SHOCK SIMULATION USING METAL-TO-METAL IMPACT **c39**

Monty Bai and Wesley Thatcher *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 97-100 (For primary document see N80-16198 07-31)
Avail: NTIS HC A09/MF A01 CSCL 20K

A technique for simulating high g level pyrotechnic shocks is described and the results of applying the technique to obtain the MIL-STD-1540A shock spectrum with a maximum acceleration of 18,000g at 2,000 Hz are presented. Designing the resonant beam and plate on which the test unit is mounted, and generating a proper impulsive load on them, were the essentials of the technique. One dimensional stress wave and Euler equations were employed in the design. A metal pendulum hammer was used to generate the impulsive load. R.E.S.

N80-16207*# Army Missile Research and Development Command, Redstone Arsenal, Ala.

AN EXPERIMENTAL DESIGN FOR TOTAL CONTAINER IMPACT RESPONSE MODELING AT EXTREME TEMPERATURES **c37**

Virginia P. Kobler, Richard M. Wyskida, and James D. Johannes *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 101-107 refs Prepared in cooperation with Alabama Univ. in Huntsville (For primary document see N80-16198 07-31)

Avail: NTIS HC A09/MF A01 CSCL 20K

An experimental design (a drop test) was developed to test the effects of confinement upon cushions. The drop test produced consistent corner void cushion data from which mathematical models were developed. A mathematical relationship between temperature and drop height was found. R.E.S.

N80-16208*# Southwest Research Inst., San Antonio, Tex.
BLAST FROM BURSTING FRANGIBLE PRESSURE SPHERES c39
E. D. Esparza and W. E. Baker *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 127-139 refs (For primary document see N80-16198 07-31)
(Grant NsG-3008)
Avail: NTIS HC A09/MF A01 CSCL 20K

Laboratory experiments conducted to obtain incident overpressure data from frangible spheres pressurized with two different gases and a vapor are described. Glass spheres under internal pressure were purposely burst to obtain time histories of overpressure using side-on pressure transducers. A scaling law for pressure spheres bursting in free-air is derived and presented. This law is simplified and used to obtain a functional relationship for the non-dimensional blast parameters. Peak overpressure, arrival and duration times, and impulse data are presented for different initial conditions and blast source energies. These dimensionless data are also compared, wherever possible, with results of theoretical calculations and compiled data for Pentolite high-explosive. The scaled data are quite repeatable and show significant differences from blast waves generated by condensed high-explosives. R.E.S.

N80-16209*# Southwest Research Inst., San Antonio, Tex.
TEST EVALUATION OF SHOCK BUFFERING CONCEPT FOR HYDRODYNAMIC RAM INDUCED BY YAWING PROJECTILE IMPACTING A SIMULATED INTEGRAL FUEL TANK c37
Patrick H. Zabel *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 141-170 refs (For primary document see N80-16198 07-31)
Avail: NTIS HC A09/MF A01 CSCL 20D

A concept for containing the shock inputs due to hydrodynamic ram caused by an impacting projectile within a fuel cell is discussed. This is to provide a buffering layer of foam, flexible, rigid or a combination thereof, which is sealed from the liquid. A program is described in which this buffering concept was tested. The effectiveness of a novel muzzle-mounted, 'tumble', test device is shown. Author

N80-16210*# Southwest Research Inst., San Antonio, Tex.
PREDICTION OF FRAGMENT VELOCITIES AND TRAJECTORIES c37
J. J. Kulesz, L. M. Vargas, and P. K. Moseley *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 171-187 refs (For primary document see N80-16198 07-31)
(Contract NAS3-20497)
Avail: NTIS HC A09/MF A01 CSCL 20K

Analytical techniques are described which predict: (1) the velocities of two unequal fragments from bursting cylindrical pressure vessels; (2) the velocity and range of portions of vessels containing a fluid which, when the vessel ruptures, causes the fragment to accelerate as the fluid changes from the liquid to the gaseous phase; and (3) the ranges of fragments subjected to drag and lift forces during flight. Numerous computer runs were made with various initial conditions in an effort to generalize the results for maximum range in plots of dimensionless range versus dimensionless velocity. R.E.S.

N80-16211*# Shock and Vibration Information Center (Defense), Washington, D. C.
THE SHOCK AND VIBRATION BULLETIN. PART 2: MODAL AND IMPEDANCE ANALYSIS, HUMAN RESPONSE TO VIBRATION AND SHOCK, ISOLATION AND DAMPING, DYNAMIC ANALYSIS
Sep. 1979 215 p refs Presented at the 49th Symp. on Shock and Vibration, Washington, D.C., 17-19 Oct. 1978 Sponsored by NASA. Goddard Space Flight Center 3 Vol.
(NASA-CR-162472; AD-A074700; Bull-49-Pt-2) Avail: NTIS HC A10/MF A01 CSCL 20K

The topics discussed include human perception of vibration; isolation and damping in airborne electro-optical systems, turbine blades, and elastomers; dynamic analysis applied to shock pulses and silver acetylide-silver nitrate explosives; and determination of dominant vibration modes using dynamic transfer functions. For individual titles, see N80-16212 through N80-16231.

N80-16212*# Martin Marietta Corp., Denver, Colo.
AN IMPEDANCE TECHNIQUE FOR DETERMINING LOW FREQUENCY PAYLOAD ENVIRONMENTS c39
Kenneth R. Payne *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 1-14 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 22B

An approximation method for determining low frequency payload environments is developed and compared to state of the art coupling/response routines. Problems in signal conditioning techniques and frequency domain analysis are discussed. Results from analytical simulations with a spring mass system and a mathematical model of the Space Transportation System and Long Duration Facility are presented. K.L.

N80-16213*# Martin Marietta Corp., Denver, Colo.
A STATISTICAL LOOK AT MODAL DISPLACEMENT RESPONSE TO SEQUENTIAL EXCITATIONS c39
William J. Karena *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 15-18 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20K

The residual displacement response to a sequence of simple excitations separated by nearly equal time intervals is evaluated on a statistical basis. Mean plus three sigma responses are plotted as a function of the number of sequential excitations for a range of damping values. The curves are derived for parametric evaluation of the vibratory pointing error for a maneuvering spacecraft, but they can be applied to other sequential excitation problems where the residual displacement in a key mode is the response parameter of interest. K.L.

N80-16214*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
ON DETERMINING THE NUMBER OF DOMINANT MODES IN SINUSOIDAL STRUCTURAL RESPONSE c39
W. L. Hallauer, Jr. and A. Franck *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 19-34 refs (For primary document see N80-16211 07-31)
(Grant NsG-1276)
Avail: NTIS HC A10/MF A01 CSCL 20K

The problem of using structural dynamic transfer function data to determine the number of vibration modes dominant in response at a given frequency is addressed. If two or more modes are closely spaced or if response is influenced strongly by distant modes, then the number of dominant modes may not be evident from examination of transfer function plots, and quantitative methods may be required. Two relatively simple methods are reviewed, and a more effective vector-fit method is described in detail. Applications of these methods are given with the use of numerically simulated transfer function data. K.L.

N80-16215*# Oklahoma Univ., Norman. School of Aerospace, Mechanical and Nuclear Engineering.
LATERAL AND TILT WHIRL MODES OF FLEXIBLY MOUNTED FLYWHEEL SYSTEMS c44
C. W. Bert and T. L. C. Chen *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 35-46 refs Sponsored by DOE (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 10B

An axisymmetric energy storage flywheel system with four degrees of freedom, two associated with lateral translation and two with tilting, was driven by an air turbine which added two more degrees of freedom. A six degree-of-freedom analysis was performed and applied to two versions of a specific design. K.L.

N80-16216*# National Inst. for Occupational Safety and Health, Cincinnati, Ohio.
WHOLE-BODY VIBRATION OF HEAVY EQUIPMENT OPERATORS c54

D. E. Wasserman, W. C. Asburry, and T. E. Doyle *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 47-68 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 05H

A vibration field study was made of workers operating track-type tractors, scrapers, motor graders, loaders, backhoes, compactors, skidders, and dump trucks. Vibration data were obtained from the vehicle floor and manseat interface, as well as from the operator's knee, shoulder, and head. The vibration spectrum analysis indicates that for the different types of machines little difference could be attributed to the experience or body mass of the operator and that most of the higher level vibration occurred below the 4 to 8 Hz human body resonance band, much of it at less than 1 Hz. K.L.

N80-16217*# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
RESEARCH RELATED TO THE EXPANSION AND IMPROVEMENT OF HUMAN VIBRATION EXPOSURE CRITERIA c54
Richard W. Shoenberger *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 69-79 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 05H

A psychophysical matching technique was used to investigate the perceived intensity of various types of vibration environments. Comparisons of sinusoidal and nonsinusoidal vibrations as well as comparisons of translational and angular vibrations were conducted. Results discriminate between alternate methods for evaluating the severity of nonsinusoidal vibrations and indicate relationships between translational and angular vibrations needed for the expansion of vibration criteria to include angular motions. K.L.

N80-16218*# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
COMPUTER AIDED DESIGN OF PASSIVE VIBRATION ISOLATORS FOR AIRBORNE ELECTRO-OPTICAL SYSTEMS c39
P. W. Whaley and Jerome Pearson (AFFDL) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 81-86 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20K

The concept of nodalization for jet-powered, winged aircraft was examined at the Flight Dynamics Laboratory using a simply supported beam loaded with a lumped mass at each end and supported by two passive isolators located arbitrarily along the beam. The Fibonacci numerical search routine was used to minimize the sum of the mean squared angular vibration responses of the two ends. For symmetric loading (end masses identical), the optimum attachment locations were the nodes of the free-free beam. The vibration reduction was several orders of magnitude compared to isolators at the ends. M.M.M.

N80-16219*# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
DESIGN OF TURBINE BLADES FOR EFFECTIVE SLIP DAMPING AT HIGH ROTATIONAL SPEEDS c07
David I. G. Jones and Agnieszka Muszynska (Polish Acad. Sci.) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 87-96 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 21E

The dynamic behavior of a blade having a root geometry compatible with low frictional forces at high rotational speeds, somewhat like a 'Christmas Tree' root, but with a gap introduced which closes up only at high speed is examined. Approximate nonlinear equations of motion are derived and solved using a method of harmonic balance. Numerical examples are discussed. M.M.M.

N80-16220*# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
A SIMPLE LOW-COST TECHNIQUE FOR MEASURING MATERIAL DAMPING BEHAVIOR c39
David I. G. Jones *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 97-103 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20K

A simple test procedure in which a cylindrical specimen of damping material supporting an added mass is impacted by a small 'hammer' is described. The force transmitted through the specimen is measured by a force gage and the acceleration experienced by the hammer is measured by an accelerometer. The transient signals so generated are displayed on a storage oscilloscope, and the modulus and loss factor of the material are derived from comparisons with a simple transient analysis of a single degree-of-freedom system having a complex stiffness for the spring element. Examples and test data are discussed and comparisons are made with results of other methods of measurement. M.M.M.

N80-16221*# Cambridge Acoustical Associates, Inc., Mass.
THE EFFECTS OF FREQUENCY, AMPLITUDE, AND LOAD ON THE DYNAMIC PROPERTIES OF ELASTOMERS c27
John E. Cole, III *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 105-117 refs (For primary document see N80-16211 07-31)
(Contract N00014-69-C-0056)
Avail: NTIS HC A10/MF A01 CSCL 11G

The behavior of the mechanical properties of elastomers under conditions of dynamic loading are considered as a criteria in the design of anti-vibration mounts. M.M.M.

N80-16222*# Army Construction Engineering Research Lab., Champaign, Ill.
LIQUID SPRING SHOCK ISOLATOR MODELING BY SYSTEM IDENTIFICATION c39
P. N. Sonnenburg, B. H. Wendler, and W. E. Fisher *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 119-134 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20D

A feasibility study was undertaken to determine if a reasonably accurate model of an off-the-shelf liquid-spring isolator could be found, using data from a few simple and inexpensive tests. A liquid spring was selected for its design versatility and potential use in high performance shock isolation systems. General acceptance of a system identification approach ultimately depends on the simplicity and cost of testing and the ability to represent installed operating conditions by the mathematical formulation. M.M.M.

N80-16223*# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A GENERALIZED DERIVATIVE MODEL FOR AN ELASTOMER DAMPER c39
Ronald L. Bagley and Peter J. Torvik *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 135-143 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20K

A generalized derivative (fractional order) is used to construct a dynamic stress-strain constitutive relation for the elastomer 3M-467. The desirable features of this constitutive relation are demonstrated and the constitutive relation is used to determine vibration time histories of a single degree-of-freedom oscillator having an elastomer damper. Author

N80-16224*# Michigan State Univ., East Lansing. School of Packaging.
SHOCK RESPONSE OF NON-LINEAR SYSTEMS c39
Kalman Peleg *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 145-157 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20K

A model consisting of a mass between two preloaded nonlinear (cubic elasticity) springs and restrained by a Coulomb and viscous damper is proposed. An approximate quasi-harmonic solution of the nonlinear differential equation of motion of the model whereby both amplitude and phase are time dependent, enables a study of the motion during the first half cycle (pulse) after collision. Formulae are developed for calculating peak acceleration, rise time, pulse duration and maximum deflection.

These are compared with corresponding formulae of special cases for which exact solutions are known. Acceleration versus time pulses are classified in accordance to pulse shape, e.g., saw-tooth, halfsine and trapezoidal, as a function of system damping. Although the model is intended mainly for quantitative design in packaging engineering problems, it is suitable for studying general shock isolation problems as well. M.M.M.

N80-16225*# Brookhaven National Lab., Upton, N. Y.
STABILITY ANALYSIS AND RESPONSE CHARACTERISTICS OF TWO-DEGREE OF FREEDOM NONLINEAR SYSTEMS c39
M. Subudhi and J. R. Curreri *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 159-163 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20K

The stability of a nonlinear two degree-of-freedom spring-mass system subjected to a sinusoidal exciting force is examined. The solution is perturbed to arrive at a set of coupled variational linear differential equations with periodic coefficients. Floquet theory is used to obtain a characteristic equation. The Routh-Hurwitz stability criterion is adopted to study the stable and unstable regions of the response curves. A computer program is developed to carry out the entire analysis. Extensive information regarding stable zones of the system response is described by means of nondimensional frequency-amplitude diagrams. The results are examined in terms of inferring dynamic response characteristics for sine sweep tests. Author

N80-16226*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
APPLICATION OF RANDOM TIME DOMAIN ANALYSIS TO DYNAMIC FLIGHT MEASUREMENTS c05
S. R. Ibrahim *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 165-170 refs (For primary document see N80-16211 07-31)
(Grant NsG-1459)
Avail: NTIS HC A10/MF A01 CSCL 01C

An approach is presented for modal identification of aerospace structures from flight measurements. This approach is the result of combining the time domain modal identification technique and the multiple channel random decrement technique. A technique is also presented to determine relative levels of excitation for identified modes. These techniques are applied to flight data taken from the B-1 bomber. Results are extremely encouraging. Author

N80-16227*# California Univ., Berkeley. Structural Engineering and Structural Mechanics Div.
SHOCK SPECTRA DESIGN METHODS FOR EQUIPMENT-STRUCTURE SYSTEMS c39
James M. Kelly and Jerome L. Sackman *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 171-176 refs (For primary document see N80-16211 07-31)
(Contract DNA001-C-0233; Grant NSF ENG-77-05197)
Avail: NTIS HC A10/MF A01 CSCL 20K

An analytical method is developed whereby a simple estimate can be obtained of the maximum dynamic response of light equipment attached to a structure subjected to ground motion. The natural frequency of the equipment, modeled as an undamped single degree-of-freedom system, is considered to be close or equal to one of the natural frequencies of the undamped N degree-of-freedom structure. This estimate provides a convenient, rational basis for the structural design of the equipment and its installation. The approach is based on the transient analysis of tuned or slightly detuned equipment-structure systems in which the mass of the equipment is much smaller than that of the structure. The results obtained are simple estimates of the maximum acceleration and displacement of the equipment.
A.R.H.

N80-16228*# Sandia Labs., Albuquerque, N. Mex.
A COMPUTATIONAL MODEL DESCRIBING THE INITIATION OF SILVER ACETYLIDE-SILVER NITRATE EXPLOSIVE BY AN INTENSE LIGHT SOURCE c28
Floyd H. Mathews *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 177-191 refs Sponsored by DOE (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 19A

The surface initiation of silver acetylide-silver nitrate explosive occurs when the explosive is exposed to irradiation produced by an electrical discharge through an array of tungsten wires, each surrounded by an air-filled Pyrex tube. The initiation process is modeled by first calculating the wire heating and subsequent arc breakdown. Then the arc energy is allowed to reradiate toward the explosive surfacd using a characteristic relaxation time. Finally, the thermal initiation of the explosive surface is modeled as the conductive transfer of heat through a surface layer of inert explosive which had previously been darkened by exposure to the sun. Initiation occurs when active explosive reaches a critical temperature. A number of unknown parameters are accommodated by normalizing the calculation to agree with the time delay before firing which was measured during a single experiment. A.R.H.

N80-16229*# Sandia Labs., Albuquerque, N. Mex.
TERMINAL VELOCITY AND ROTATION RATE OF A FLYER PLATE PROPELLED BY A TUBE-CONFINED EXPLOSIVE CHARGE c28
R. A. Benham *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 193-201 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 19A

A method for predicting the terminal velocity and rotation rate of a flyer plate propelled by an open-ended, tube-contained explosive charge was developed. A procedure for calculating the fraction of the explosive that is effective in accelerating the plate leads to a very simple set of equations for predicting the performance of the explosive system. Calculations using this theory are compared with results from numerous experiments. Measured values of flyer velocity are predicted within plus or minus 5 percent and rotation rates with plus or minus 10 percent. Author

N80-16230*# Naval Surface Weapons Center, White Oak, Md.
A STABILITY THEOREM FOR A DYNAMICALLY LOADED LINEAR VISCOELASTIC STRUCTURE c39
D. W. Nicholson *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 203-208 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20K

The response of a linear viscoelastic structure to a dynamic load is considered. For the finite element equation of dynamic equilibrium a representation of the solution is derived using the exponential matrix function, and this representation permits application of the highly efficient method of Gaussian quadrature. Positive definiteness and other properties of the system mass, damping and stiffness matrices are shown to entail satisfaction of an inequality ensuring a physical and a numerical type of stability. Author

N80-16231*# Michigan State Univ., East Lansing. School of Packaging.
ANALOG DOUBLE INTEGRATION OF SHOCK PULSES c39
Kalman Peleg and Richard A. Lund (MTS Systems Corp., Minneapolis, Minn.) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 209-217 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20K

Conventional monitoring and evaluation in shock testing is based mainly on acceleration pulse recordings from a shock machine and a tested product. For product fragility boundary establishment, shock machine velocity change is either computed from drop height, measured by an optical velocity meter or single integration of the acceleration time pulse. An approach to acceleration transient analysis is described whereby a real-time double integrator circuit provides analog readout of velocity and displacement as well as acceleration. Absolute and relative velocity changes and displacements are obtained by means of consecutive integration of signals from acceleration transducers. Although an analog double integration circuit is featured, the applications also apply to digital double integration. Author

N80-16232*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HOMOGENEOUS ALIGNMENT OF NEMATIC LIQUID

CRYSTALS BY ION BEAM ETCHED SURFACES
E. G. Wintucky, R. Mahmood, and D. L. Johnson 19 Oct. 1979 19 p refs Presented at 156th Meeting of the Electrochem. Soc., Los Angeles, 15-19 Oct. 1979
(NASA-TM-81378; E-283) Avail: NTIS HC A02/MF A01 CSCL 20L

A wide range of ion beam etch parameters capable of producing uniform homogeneous alignment of nematic liquid crystals on SiO2 films are discussed. The alignment surfaces were generated by obliquely incident (angles of 5 to 25 deg) argon ions with energies in the range of 0.5 to 2.0 KeV, ion current densities of 0.1 to 0.6 mA sq cm and etch times of 1 to 9 min. A smaller range of ion beam parameters (2.0 KeV, 0.2 mA sq cm, 5 to 10 deg and 1 to 5 min.) were also investigated with ZrO2 films and found suitable for homogeneous alignment. Extinction ratios were very high (1000), twist angles were small (< or = 3 deg) and tilt-bias angles very small (< or = 1 deg). Preliminary scanning electron microscopy results indicate a parallel oriented surface structure on the ion beam etched surfaces which may determine alignment. Author

N80-16233# Naval Ship Research and Development Center, Bethesda, Md. Ship Performance Dept.
ACCURACY OF HYDROFOIL LOADING PREDICTIONS OBTAINED FROM A LIFTING-SURFACE COMPUTER PROGRAM Final Report
Peter K. Besch and Edwin P. Rood, Jr. Sep. 1979 203 p refs
(ZF4342101)
(AD-A074702; DTNSRDC-79/039) Avail: NTIS HC A10/MF A01 CSCL 13/10

To provide guidance for hydrofoil designers, an extensive operational evaluation was made of a computer-based lifting-surface theory for calculating hydrodynamic loading on hydrofoils in steady and unsteady motion in inviscid, subcavitating flow at finite depth. Both the numerical stability and the accuracy in comparison with model data were estimated. By use of an empirical correction, lift predictions can be made with an accuracy of about 15 to 20 percent, while pitching moment predictions are substantially less accurate. Determination of the accuracy was hindered by insufficient or imprecise data. Documentation for the computer program is given. Author (GRA)

N80-16234# Aerojet Liquid Rocket Co., Sacramento, Calif.
JEFF(A) MIXED-FLOW MODEL FAN PERFORMANCE OPTIMIZATION Final Report
S. A. Lorenc Jun. 1979 120 p refs
(Contract N00014-78-C-0441)
(AD-A074571; ALRC-FDB630-001) Avail: NTIS HC A06/MF A01 CSCL 13/10

This model test program was conducted in order to improve the performance of the JEFF(A) Mixed-Flow Fan. Both rotor and housing changes were made to the existing model fan and tests were conducted in the ALRC Physics Laboratory. Rotor modifications consisted of varying blade length and narrowing the rotor width at the exit. Housing size was varied by changing axial and radial dimensions. The sensitivity of fan performance to IGV positioning was also determined for both flat and twisted vanes. Finally, full size fan performance was predicted for the best combination of housing and rotor. Recommendations are also made for further improvement of the Mixed-Flow Fan concept. GRA

N80-16235# Oak Ridge National Lab., Tenn.
HEAVY-SECTION STEEL TECHNOLOGY PROGRAM Quarterly Progress Report, Jan. - Mar. 1979
G. B. Whitman and R. H. Bryan Aug. 1979 122 p refs
(Contract W-7405-eng-26)
(NUREG-CR-0818; ORNL/NUREG/TM-324) Avail: NTIS HC A06/MF A01

Research related to all areas of the technology of the materials fabricated into thick-section primary-coolant containment systems of light-water-cooled nuclear power reactors is presented. The behavior and structural integrity of steel pressure vessels containing cracklike flaws are considered. Current work is organized into six tasks: (1) program administration and procurement; (2) fracture mechanics analyses and investigations; (3) effect of high-temperature primary reactor water on the subcritical crack growth of reactor vessel steels; (4) investigations of irradiated materials; (5) pressure vessel investigations; and (6) thermal shock investigations. A user-oriented finite-element computer program for calculating mixed-mode stress-intensity factors (SIF's) for nozzle corner flaws of arbitrary shape is being developed. A method for estimating stable crack growth in fracture toughness specimens was developed and applied to the analysis of several sets of data. DOE

N80-16236# Los Alamos Scientific Lab., N. Mex. Cryogenics Group.
SAFETY OF LIQUID HYDROGEN IN AIR TRANSPORTATION
F. J. Edeskuty 1979 18 p refs Presented at the Hydrogen in Air Transportation Conf., Stuttgart, 10 Sep. 1979
(Contract W-7405-eng-36)
(LA-UR-79-1416; CONF-790942-1) Avail: NTIS HC A02/MF A01

The safety factors and problems associated with the use of liquid hydrogen as an aircraft fuel are discussed. The properties of liquid hydrogen are reviewed and their effect upon airline operations is reported. The effects include safety requirements for storage and refueling systems and safety devices for aircraft hangars and buildings in the close vicinity. Safety problems which need further research are addressed. These include the consequences of a hydrogen spill and dispersion, hydrogen combustion, and hydrogen disposal.

N80-16237# Argonne National Lab., Ill.
ENERGY AND MATERIALS FLOWS IN THE FABRICATION OF ALUMINUM PRODUCTS
R. M. Arons and A. M. Wolsky Aug. 1978 69 p refs
(Contract W-31-109-eng-38)
(ANL/CNSV-3) Avail: NTIS HC A04/MF A01

The aluminum fabrication process is described and energy use and efficiency for each process step is cited. It is concluded that the most effective approaches to energy conservation is the use of methods for waste heat reduction and recovery, reduction of scrap generation during processing, use of induction heating for both melting and heat treating, and use of alternative processing techniques that eliminate energy intensive intermediate steps. DOE

N80-16238# Bureau of Mines, Tuscaloosa, Ala. Tuscaloosa Metallurgy Research Center.
APPLICATION OF A DIFFUSION MODEL TO OXIDE SINTERING
C. D. Messelt, D. A. Stanley, and E. K. Landis, Jr. 1979 16 p refs
(PB-300399/3; BM-RI-8369) Avail: NTIS HC A02/MF A01 CSCL 11B

The application of a diffusion model to sintering rate data developed for lithium titanium ferrite was investigated. The data were obtained by sintering pressed pellets under identical conditions for various times up to 11 hours. Stereological measurements were made on polished sections, and sintering rates were calculated. A model for intermediate stage sintering was fitted to the stereological data. This procedure produces a method by which these type data are used to study the relative importance of volume and grain boundary diffusion under a variety of sintering conditions. GRA

N80-16239# Colorado School of Mines, Golden. Excavation Engineering and Earth Mechanics Inst.
MECHANICAL TUNNEL BORING PREDICTION AND MACHINE DESIGN Final Report
Levent Ozdemir and Fun-Den Wang Feb. 1979 225 p refs
(Grant NSF APR-77-04183)
(PB80-101660; EMI-427; NSF/RA-790161) Avail: NTIS HC A10/MF A01 CSCL 13B

Research efforts are described to obtain accurate data to verify previously developed equations for mechanical tunnel boring. Procedures pertinent to machine design and performance were also investigated. A laboratory indentation test procedure was designed to predict field boring performance. Extensive indentation tests were conducted in samples of three rock types, results of which confirmed the applicability of indentation tests as a reliable tool to predict disc cutting forces. Field boring data from

an active tunneling site indicate that indentation tests can be used as a means of accurately estimating field boring performance. GRA

N80-16240# Illinois State Dept. of Transportation, Springfield. Bureau of Materials and Physical Research.
EFFECT OF SUBBASE TYPE AND SUBSURFACE DRAINAGE ON BEHAVIOR OF CRC PAVEMENTS Interim Report, May 1971 - Dec. 1977
Jagat S. Dhamrait and Donald R. Schwartz May 1979 41 p refs
(PB80-101165; Physical Research-83; FHWA/IL/PR-083) Avail: NTIS HC A03/MF A01 CSCL 13B

As part of an extensive study conducted to determine the significant relationship between the behavior of CRC pavement and various design features, an evaluation was made of four types of subbase and three types of subsurface drainage systems. Deformation of the subbase due to loading and/or subbase erosion under severe climate and moisture conditions can cause severe pavement distress. The subsurface drainage system with longitudinal underdrains placed at the edge of the stabilized subbase was the most efficient in removing free water from beneath the pavement structure. GRA

N80-16241# Ryland Research, Inc., Santa Barbara, Calif.
A STUDY OF INDIRECT FIRE LOSSES FROM FIRES IN NON-RESIDENTIAL PROPERTIES. VOLUME 1: RESEARCH REPORT Final Report
Harold L. Hicks and Richard R. Liebermann 1 Mar. 1979 136 p refs Prepared in cooperation with Tecolote Research, Inc., Santa Barbara, Calif.
(Contract C-7-35539)
(PB-299126/3) Avail: NTIS HC A07/MF A01 CSCL 13M

Several models were developed for estimating indirect losses in commercial occupancies at the local and national levels, and for mercantile, nonmanufacturing, manufacturing, and warehousing occupancies. Appendices containing an annotated bibliography of reference literature; a description of the mathematical tool -- regression analysis -- used to develop a statistical relationship between direct and indirect losses; six case studies; and a description of the computer program used to develop estimates of indirect fire loss are included. GRA

N80-16242# Ryland Research, Inc., Santa Barbara, Calif.
A STUDY OF INDIRECT FIRE LOSSES FROM FIRES IN NON-RESIDENTIAL PROPERTIES. VOLUME 3: INDIRECT RESIDENTIAL FIRE LOSS - A CASE STUDY Final Report
Harvey G. Ryland 1 Mar. 1979 52 p
(Contract C-7-35539)
(PB-299127/1) Avail: NTIS HC A04/MF A01 CSCL 13M

The results of an analysis of indirect losses and related experiences associated with a specific residential fire are presented. Actual components of indirect losses and gains (for both owner/occupant and the general community), estimates of these losses and gains, the total amount of indirect losses for the incident, and recommendations concerning the types of information which should be made available to citizens on how to prepare for and cope with residential fire losses are provided. GRA

N80-16243# South Carolina Univ., Columbia. College of Engineering.
A STUDY OF HIGHWAY EMBANKMENT CONSTRUCTION IN SOUTH CAROLINA MARSHLANDS Final Report
W. K. Humphries 31 May 1979 74 p refs Sponsored in part by South Carolina Dept. of Highways and Public Transportation and FHWA
(PB-300816/6; FHWA/SC-79/002) Avail: NTIS HC A04/MF A01 CSCL 13C

A site in Charleston, South Carolina was studied to determine practical alternatives to bridging over soft foundation soils. Many states with similar soil conditions to those evaluated at this site were contacted concerning their alternative solutions to bridging. A comparative cost study was made for the particular site in Charleston for several possible alternative solutions, and ecological effects of each were considered. It was found that the use of sand drains in combination with surcharging and geotechnical fabrics offer an alternative which is cost effective and sound engineering-wise. GRA

N80-16244# Michigan Dept. of State Highways and Transportation, Lansing. Testing and Research Div.
EFFECTIVENESS OF NEOPRENE SEALS IN PREVENTING CONCRETE PAVEMENT CONTRACTION JOINT DETERIORATION Final Report, 1973 - 1977
F. J. Bashore and A. W. Price Jul. 1979 32 p
(PB-300594/9; R-1122; FHWA/MI-79/2) Avail: NTIS HC A03/MF A01 CSCL 13B

Over 200 cores were taken from contraction joints sealed with compressible seals on 17 construction projects over a period of four years in order to determine the amount and rate of deterioration of the concrete at the bottom of the joint. Seal performance was rated, chloride content of concrete was determined, and drainability of base material was rated. Results indicate that the neoprene seals are performing well in preventing the entry of incompressibles but permit the entry of liquids into virtually all joints. The data indicate that most of the deterioration occurred during the first five years and shows little significant changes for the following years. Several modifications in design, construction, and maintenance of concrete contraction joints are suggested. GRA

N80-16245# West Virginia Univ., Morgantown. Dept. of Civil Engineering.
DETERMINATION OF THE IN SITU PERMEABILITY OF BASE AND SUBBASE COURSES Final Report, 25 May 1976 - 31 May 1979
Lyle K. Moulton and Roger K. Seals May 1979 161 p refs
(Contract DOT-FH-11-9060)
(PB-300908/1; FHWA/RD-79/88; CES-4003) Avail: NTIS HC A08/MF A01 CSCL 13B

The development of a prototype in situ test device, designated the field permeability testing device for determination of the permeability of highway base and subbase courses is described and discussed. The feasibility of in situ permeability measurement techniques was investigted which led to the selection of the velocity method of in situ permeability determination for further development. A prototype field permeability test device was constructed and an extensive program of laboratory and field evaluations of this equipment was performed. It was concluded that the prototype field permeability test device developed satisfies project objectives and provides a convenient means for the determination of the in situ coefficient of permeability of highway bases and subbases with reasonable accuracy and reproducibility. GRA

N80-16246# Virginia Highway and Transportation Research Council, Charlottesville.
EVALUATION OF EXPERIMENTAL FLEXIBLE PAVEMENTS Final Report, Nov. 1971 - Jun. 1979
K. H. McGhee Jul. 1979 57 p refs
(PB-310251/5; VHTRC-80-R5; FHWA/VA-80/05) Avail: NTIS HC A04/MF A01 CSCL 13B

The performance of seven Virginia pavements was evaluated. Among the major findings of the study are: (1) pavements having equivalent design thickness indices are not necessarily equivalent in cost or early structural strength; (2) full-depth asphaltic concrete pavements can give excellent performance in very poor soil areas, especially when the subgrade is modified with cement stabilization; (3) transverse shrinkage cracks reflect from a cement treated stone subbase through 3 in. of bituminous concrete in as little as 18 months and through 7 in. of bituminous concrete in less than 5 years; and (4) sandwich-layer systems can have a detrimental effect on pavement performance. GRA

N80-16247# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Geotechnical Lab.
AN EVALUATION OF METHODOLOGY FOR PREDICTION AND MINIMIZATION OF DETRIMENTAL VOLUME CHANGE OF EXPANSIVE SOILS IN HIGHWAY SUBGRADES. VOLUME 1: RESEARCH REPORT Final Report
Donald R. Snethen Mar. 1979 203 p refs
(PB-301254/9; FHWA/RD-79/49) Avail: NTIS HC A10/MF A01 CSCL 13B

The methodology for prediction and minimization of detrimen-

tal volume change of expansive soils in highway subgrades is evaluated. The occurrence and distribution of expansive soils is reported and the roles of the microscale mechanisms that cause volume change are defined. Appropriate treatment alternatives for new and existing highways are assessed and procedures for the design and construction of new pavements and maintenance of existing pavements are recommended. A.W.H.

N80-16248# North Carolina State Univ. at Raleigh. Highway Research Program.

EVALUATION OF THE EFFECTIVENESS OF FABRIC REINFORCEMENT IN EXTENDING THE IN-SERVICE LIFE OF BITUMINOUS CONCRETE OVERLAYS Final Report

W. G. Mullen and Robert J. Hader Jul. 1979 82 p Prepared in cooperation with North Carolina State Dept. of Transportation, Raleigh

(PB-301305/9; ERSD-110-71-5; FHWA/NC-79/001) Avail: NTIS HC A05/MF A01 CSCL 13B

Tests of fabric and non-fabric treated overlays of a jointed unreinforced portland cement concrete pavement on US 70 in Orange County, North Carolina are described. Four continuous fabric and four strip fabric treatments were used in addition to four non-fabric treatments, one of which was the regular two inch 1-2 overlay used for control. The fabrics were three woven or non-woven polymeric materials and one woven fiberglass. The four non-fabric treatments consisted of a surface treatment type mat course, a plant mixed mat coat, an opengraded mix course laid directly on the old pavement and covered with the 1-2 mix, and the 1-2 mix used for control. GRA

N80-16249# Massachusetts Inst. of Tech., Cambridge. Constructed Facilities Div.

ASEISMIC DESIGN PROCEDURES FOR REINFORCED CONCRETE FRAMES. SEISMIC BEHAVIOR AND DESIGN OF BUILDINGS

John M. Biggs, Wai K. Lau, and Drew Persinko Jul. 1979 90 p refs

(Grant NSF ENV-77-14714)

(PB80-104128; NSF/RA-790205; Rept-1) Avail: NTIS HC A05/MF A01 CSCL 13M

Twelve reinforced concrete frames are designed for earthquake and gravity loads using three different procedures for determining the seismic design loads. The procedures are: (1) UBC static load approach; (2) modal analysis using inelastic response spectra; and (3) substitute structure method. The frames are of 4, 8 and 10 stories. The validity of each design procedure is evaluated by time-history analysis of each frame to determine maximum local ductility demands due to both real and artificial ground motion. None of the three methods is found to be completely satisfactory because the ductility demands are not the same as intended in the design and are not evenly distributed over the frame. GRA

N80-16250# Washington Univ., St. Louis, Mo. Dept. of Civil Engineering.

ANALYTICAL METHOD FOR DETERMINING SEISMIC RESPONSE OF COOLING TOWERS ON FOOTING FOUNDATIONS Interim Report

O. M. El-Shafee and P. L. Gould Sep. 1979 228 p refs

(Grant NSF PFR-79-00012)

(PB-301398/3; RR-55; NSF/RA-790165; IR-1) Avail: NTIS HC A11/MF A01 CSCL 13M

A finite element model was developed to analyze shells of revolution under dynamic loading with soil-structure interaction effects. The model consists of high-precision rotational shell finite elements, representing the axisymmetric shell, supported on an equivalent boundary system, representing the soil medium. The substructure method is used to model the shell and soil components. In addition to the seismic analysis capability of the proposed model, it is also applicable to other dynamic loads such as wind. The dynamic behavior of a hyperboloidal cooling tower is studied using the proposed model. Dynamic properties are studied and stress analysis is carried out for a variety of soil conditions. GRA

N80-16251# Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.

PROBABILISTIC ANALYSIS OF TEMPERATURE LOADS FOR STRUCTURES, STRUCTURAL LOADS ANALYSIS AND SPECIFICATIONS PROJECT

Paul Millman, Robert Kilcup, and C. Allin Cornell Mar. 1979 211 p refs

(Grant NSF ENV-73-00345)

(PB-301415/6; R79-10; NSF/RA-790179) Avail: NTIS HC A10/MF A01 CSCL 13M

Three methods for the probabilistic analysis of temperature effects in building elements are applied to a simple one-dimensional temperature model which could represent a building wall element. The first method is a finite difference solution of the governing differential equation with an actual temperature record as input. In the second method, the temperature record is characterized in the frequency domain by a power spectral density function. The third method uses a simplified approach in which it is observed that the average strain and curvature in a wall are similar in effect to a time averaging filter applied to the temperature record. GRA

N80-16252# Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.

EXPERIMENTAL STUDY OF FRAME-WALL INTERACTION IN REINFORCED CONCRETE STRUCTURES SUBJECTED TO STRONG EARTHQUAKE MOTIONS

Daniel P. Abrams and Mete A. Sozen May 1979 400 p refs

(Grant NSF PFR-78-16318)

(PB-301091/5; Structural-Research-Ser-460; UILU-ENG-79-2002; NSF/RA-790132) Avail: NTIS HC A17/MF A01 CSCL 13M

The response of frame-wall structures to strong earthquake motions was studied. Each small-scale structure consisted of two three-bay frames and one wall resisting lateral loads in parallel. Measurements included accelerations, displacements, and forces resisted by the interior wall. The response of the test structures was examined in terms of apparent modal properties to evaluate the correctness of using a linear modal analysis with arbitrarily softened member stiffnesses to estimate response of the nonlinearly behaving structures. Internal force measurements were also examined to investigate frame-wall interaction in the nonlinear range of response and to check the reliability of the proposed design method for proportioning individual elements. GRA

N80-16253# California Univ., Richmond. Earthquake Engineering Research Center.

INVESTIGATION OF THE NONLINEAR CHARACTERISTICS OF A THREE STORY STEEL FRAME USING SYSTEM

Izak Kaya and Hugh D. McNiven Dec. 1978 97 p refs

(Grant NSF ENV-76-04262)

(PB-301363/8; UBC/EERC-78/25; NSF/RA-780681) Avail: NTIS HC A05/MF A01 CSCL 13M

Two mathematical models were constructed of a three-story steel frame that are meant to predict its responses to seismic disturbances. The models constructed are meant to predict nonlinear response. This extension consists of accounting both for changes in the damping coefficients when the amplitudes of motion are large, and for yielding by including the hysteretic behavior of the ends of the members. The hysteretic relationship between the bending moments and rotations at the ends of the members are modeled. With the introduction of hysteretic material behavior, three parameters are added to the eight which are a carry-over from the linear model, so that the new nonlinear models contain eleven parameters. GRA

N80-16254# California Univ., Richmond. Earthquake Engineering Research Center.

SEISMIC BEHAVIOR OF REINFORCED CONCRETE INTERIOR BEAM-COLUMN SUBASSEMBLAGES

Suthpoul Viwathanatepa, Egor P. Popov, and Vitelmo Y. Bertero Jun. 1979 201 p refs

(Grants NSF AEN-73-07734; NSF ENV-76-04263)

(PB-301326/5; UCB/EERC-79/14; NSF/RA-790186) Avail: NTIS HC A10/MF A01 CSCL 13M

Details of experiments to test the seismic behavior of reinforced concrete subassemblages carried out on beam-column subassemblages are presented as well as an evaluation of the significance of the analytical and experimental results obtained. Two virgin concrete subassemblages and one repaired subassem-

blage were tested. A horizontal force was applied to one subassemblage to generate a large single hysteretic loop, the initial part of which provided information on monotonic loading. Once the loading sequence was completed, this specimen was repaired by epoxy injection processes and an incremental cyclic load was applied until failure occurred. The second specimen was tested to failure by applying a similar loading sequence. GRA

N80-16255# California Univ., Richmond. Earthquake Engineering Research Center.
STATIC TILT TEST OF A TALL CYLINDRICAL LIQUID STORAGE TANK
Ray W. Clough and Akira Niwa Feb. 1979 118 p refs Sponsored by Chevron Oil Field Res. Co.
(PB-301167/3; UCB/EERC-79/06) Avail: NTIS HC A06/MF A01 CSCL 13M

Results of a static tilt test investigation of a 7 3/4 x 15 ft cylindrical liquid storage tank are presented. The test is performed by mounting the tank on a rigid platform, filling it with water, and tilting the platform by lifting one edge with a laboratory crane. Principal test parameters include water depth, tilt angle top condition (open or with roof), and base fixity condition. Test measurements include tank deformations and membrane stresses. The observed behavior is also compared with results to typical design calculations. The unanchored tank tilts more and develops much greater axial stresses than are indicated by typical design procedures. GRA

N80-16256*# National Bureau of Standards, Boulder, Colo. Thermophysical Properties Div.
PRODUCING SLUSH OXYGEN WITH AN AUGER AND MEASURING THE STORAGE CHARACTERISTICS OF SLUSH HYDROGEN
Roland Voth and Paul R. Ludtke Mar. 1979 42 p refs
(NASA Order CC-6253-QA)
(NASA-CR-158412; PB-298555/4; NBSIR-79-1607) Avail: NTIS HC A03/MF A01 CSCL 07D

An auger rotating inside a brass tube refrigerated with liquid helium was used to produce liquid-solid (slush) mixtures of oxygen. The auger produced small particles of solid oxygen so that the resulting mixture could be transferred and stored. The auger could produce slush continuously in an appropriate system, and it could produce slush at pressures higher than the triple point pressure of the oxygen. Three long term storage tests were conducted on an Apollo hydrogen vessel. Filling with slush instead of liquid hydrogen increased the storage time before venting by 1.08 to 1.17 times and increased the mass loaded by 1.11 to 1.13 times. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also 04 Aircraft Communications and Navigation and 17 Spacecraft Communications, Command and Tracking.

N80-16257 Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ELECTRIC AND MAGNETIC FIELDS OF AN INTENSE PULSE OF RELATIVISTIC ELECTRONS PROPAGATING THROUGH AIR Ph.D. Thesis
Kenneth Allen Dreyer 1979 206 p
Avail: Univ. Microfilms Order No. 7923337

The theoretical models developed for the electromagnetic fields associated with an electron beam propagating in air are described. One and two dimensional models of the fields, and a model for the electron avalanche of the air are discussed. The ionization process over a pressure range of from five Torr to 760 Torr is described and the net current which saturates near 15 kiloamps at sealevel pressure, and saturates at lower values at lower air pressures is examined. Dissert. Abstr.

N80-16258 Stanford Univ., Calif.
SPECTRAL PEAK AMPLITUDE CODING FOR VOICE DATA COMPRESSION Ph.D. Thesis
George Heavener Smith 1979 101 p
Avail: Univ. Microfilms Order No. 8002017

A speech coding technique which exploits the quasiperiodic nature of voiced speech without relying on pitch estimation is explored. The technique relies on the fact that the bulk of the energy is a short term Fourier transform of voiced speech resides in about a dozen relatively narrowband spectral peaks. The technique was applied to speech whitened by an LPC inverse filter. Spectral peak coding was also applied to the original speech waveform without inverse filtering and experiments are described which explore the issues of the number of peaks required, the peak widths required, the amplitude and phase quantization, and efficient coding for marking the peak frequencies. An intelligibility experiment is described which demonstrates that the technique can robustly code speech at about 8 to 9 kbps. Dissert. Abstr.

N80-16259# Rome Air Development Center, Griffiss AFB, N.Y.
FAA LIGHTNING PROTECTION STUDY: REPORT OF INVESTIGATIONS RELATIVE TO PROVIDING LIGHTNING PROTECTION FOR THE REMOTE CENTER AIR-TO-GROUND (RCAG)
Richard M. Cosel May 1979 13 p refs
(Contract DOT-FA72WAI-356)
(AD-A076943; FAA-RD-79-102) Avail: NTIS HC A02/MF A01 CSCL 17/2

The susceptibility of FAA electronic systems to induced electromagnetic pulse effects due to lightning is considered. Protective devices adequate for low voltage solid state systems are proposed. The Remote Center Air to Ground system is presented. While the RCAG does contain solid state circuitry with potentially susceptible components, they are sufficiently isolated from transients so that effects are apparently negligible. Two separate reviews of four RCAG's in Florida failed to surface any outages directly attributable to lightning induced transients on control lines. M.M.M.

N80-16260*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TECHNIQUE TO DETERMINE LOCATION OF RADIO SOURCES FROM MEASUREMENTS TAKEN ON SPINNING SPACECRAFT
J. Fainberg Nov. 1979 57 p refs Submitted for publication
(NASA-TM-80598) Avail: NTIS HC A04/MF A01 CSCL 20N

The procedure developed to extract average source direction and average source size from spin-modulated radio astronomy data measured on the IMP-6 spacecraft is described. Because all measurements are used, rather than just finding maxima or minima in the data, the method is very sensitive, even in the presence of large amounts of noise. The technique is applicable to all experiments with directivity characteristics. It is suitable for onboard processing on satellites to reduce the data flow to Earth. The application to spin-modulated nonpolarized radio astronomy data is made and includes the effects of noise, background, and second source interference. The analysis was tested with computer simulated data and the results agree with analytic predictions. Applications of this method with IMP-6 radio data have led to: (1) determination of source positions of traveling solar radio bursts at large distances from the Sun; (2) mapping of magnetospheric radio emissions by radio triangulation; and (3) detection of low frequency radio emissions from Jupiter and Saturn. M.M.M.

N80-16261*# National Aeronautics and Space Administration. Pasadena Office, Calif.
ANTENNA FEED SYSTEM FOR RECEIVING CIRCULAR POLARIZATION AND TRANSMITTING LINEAR POLARIZATION Patent Application
Boris L. Seidel (JPL) and Dan A. Bathker, inventors (to NASA) (JPL) Filed 30 Oct. 1979 13 p
(Contract NAS7-100)
(NASA-Case-NPO-14362-1; US-Patent-Appl-SN-106118) Avail: NTIS HC A02/MF A01 CSCL 20N

An invention is described which provides for receiving a circularly polarized signal from an antenna feed connected to orthogonally spaced antenna elements. It also provides for transmitting a linearly polarized signal through the same feed

without switches, and without suffering a 3 dB polarization mismatch loss, using an arrangement of hybrid junctions. The arrangement is comprised of two dividing hybrid junctions, each connected to a different pair of antenna elements and a summing hybrid junction. In one version, a receiver is connected to the summing hybrid junction directly. A diplexer is used to connect a transmitter to only one pair of antenna elements. In another version, designated left and right circularly polarized (LCP and RCP) transmitters are connected to the summing hybrid junction by separate diplexers, and separate LCP and RCP sensitive receivers are connected to the diplexers in order to transmit linearly polarized signals using all four antenna elements while receiving circularly polarized signals as before. An orthomode junction and horn antenna may replace the two dividing hybrid junctions and antenna feed. NASA

N80-16262# *Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Space Dept.*

COMPARISON OF RADAR DERIVED RAIN ATTENUATION WITH THE COMSTAR BEACON AT 28.56 GHz FOR SUMMER AND WINTER PERIODS

Julius Goldhirsh Jul. 1979 38 p refs

(Contract N00024-78-C-5384)

(APL/JHU/SIR-79U-016) Avail: NTIS HC A03/MF A01

Results are given pertaining to an experiment whose aims are to test and improve the accuracy of radar derived slant path rain attenuation methods. These estimated results are compared with measured rain fade levels of the COMSTAR beacon signal at 28.56 GHz at Wallops Island, Virginia. The data base corresponds to five rain days flanking the winter of 1978-79 during which 715 minutes of simultaneous radar and disdrometer data were obtained. Agreement between estimated and measured individual rain fade events was found to be generally good. Agreement between corresponding conditional cumulative fade distributions was excellent. The Marshall-Palmer distribution was injected into the radar program and gave similarly good results. The application of the Marshall-Palmer distribution for stratiform type rains as is generally the rain type for winter periods is consistent with the results obtained. M.M.M.

N80-16263*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

WEIGHTING IN DIGITAL SYNTHETIC APERTURE RADAR PROCESSING

Alan DiCenzo 15 Nov. 1979 25 p refs

(Contract NAS7-100)

(NASA-CR-162684; JPL-PUB-79-94) Avail: NTIS HC A02/MF A01 CSCL 17I

Weighting is employed in synthetic aperture radar (SAR) processing to reduce the sidelobe response at the expense of peak center response height and mainlobe resolution. The weighting effectiveness in digital processing depends not only on the choice of weighting function, but on the fineness of sampling and quantization, on the time bandwidth product, on the quadratic phase error, and on the azimuth antenna pattern. The results of simulations conducted to uncover the effect of these parameters on azimuth weighting effectiveness are presented. In particular, it is shown that multilook capabilities of future SAR systems may obviate the need for consideration of the antenna pattern, and that azimuth time-bandwidth products of over 200 are probably required before the digital results begin to approach the ideal results. J.M.S.

N80-16264*# Computer Sciences Corp., Silver Spring, Md. Systems Sciences Div.

A SURVEY OF AIRBORNE RADAR SYSTEMS FOR DEPLOYMENT ON A HIGH ALTITUDE POWERED PLATFORM (HAPP) Final Report

B. J. Choudhury and K. C. Leung Oct. 1979 39 p refs

(Contract NAS6-6569)

(NASA-CR-156860; CSC/TM-79/6294) Avail: NTIS *HC A03/MF A01 CSCL 17I*

A survey was conducted to find out the system characteristics of commercially available and unclassified military radars suitable for deployment on a stationary platform. A total of ten domestic and eight foreign manufacturers of the radar systems were identified. Questionnaires were sent to manufacturers requesting information concerning the system characteristics: frequency, power used, weight, volume, power radiated, antenna pattern, resolution, display capabilities, pulse repetition frequency, and sensitivity. A literature search was also made to gather the system characteristics information. Results of the survey are documented and comparisons are made among available radar systems. M.M.M.

N80-16265# Massachusetts Inst. of Tech., Cambridge. Information and Decision Sciences Lab.

ON THE EFFECT OF REDUNDANCY ON THE MULTIPLE ACCESS BROADCAST CHANNEL *M.S. Thesis*

Oliver Chukwudi Ibe Aug. 1979 78 p refs

(Contract N00014-75-C-1183; ARPA Order 3045)

(AD-A073579; LIDS-TH-924) Avail: NTIS HC A05/MF A01 CSCL 17/2

We consider strategies for transmitting packets over a multiple access broadcast channel. In the strategies considered, a message is formatted into K packets and N-K redundant packets are added to these K packets to form what we call a superpacket. We propose a simple coding scheme that sets these N packets of a superpacket into a special temporal pattern. With a superpacket constructed in this manner, it is possible to reconstruct packets which are lost through collision on the channel with the packets of other superpackets. We compare the throughput of our scheme with that of the slotted Aloha scheme. We use as our retransmission strategy the conflict resolving tree algorithm of Capetanakis. GRA

N80-16266# *California Univ., Los Angeles.*

SOME FUNDAMENTAL CONSIDERATIONS OF THE EQUATION OF RADIATIVE TRANSFER

J. G. Kuriyan and E. C. G. Sudarshan Oct. 1978 24 p refs

(Contract EY-76-S-05-3992)

(ORO-3992-345) Avail: NTIS HC A02/MF A01

The vector transfer equation of the direct beam (Beer's law) is derived from first principles. It is shown that the analysis of this equation provides a satisfactory resolution of two problems underlying the radiative transfer of the vector electromagnetic field. The results also show that the Beer's law will have to be modified to make a matrix law to accomodate systems that are not spherically symmetric. R.C.T.

N80-16267# *National Telecommunication Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.*

PROBABILITY OF INTERMODULATION INTERFERENCE IN *AN EXPANDED CB SERVICE Final Report*

Leslie A. Berry Jul. 1979 26 p refs

(Contract FCC-RA-0056-9)

(PB-300296/1; NTIA/TM-79/15; FCC/PRB/PD-79/01) Avail: NTIS HC A03/MF A01 CSCL 17B

In 1976, the Federal Communications Commission expanded the Citizens Radio Service from 23 to 40 channels. If the band had been expanded more, some channels would have been separated by at least 450 KHz. The intermediate frequency (IF) on many CB receivers is 455 KHz, so separations this large could result in intermodulation product interference. The probability of second order intermodulation interference in an expanded CB service is calculated. The results are presented in the form of decreases in the average operational range of CB stations in the presence of radio noise, co-channel interference, and intermodulation interferences. It is concluded that if 40 single-sideband only channels are added to the present Citizens Radio Service, second-order intermodulation interference will decrease the median operation range by less than 10 percent, while allowing a large increase in the numbers of users. GRA

N80-16268# National Telecommunication Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.

A COMPATIBILITY ANALYSIS OF SPREAD-SPECTRUM AND FM LAND MOBILE RADIO SYSTEMS

John R. Juroshek Aug. 1979 77 p refs

(PB-300651/7; NTIA/REPT-79/23) Avail: NTIS HC A05/MF A01 CSCL 17B

The possibility of overlaying a spread-spectrum system into frequency bands containing conventional FM land-mobile systems is examined. Overlaying is interpreted as meaning the unrestricted operation of spread-spectrum and FM mobiles throughout the same service area and on the same frequency. Conventional

spread-spectrum and FM systems are assumed where a single base serves a large urban area. A theoretical compatibility study is described that concludes that significant interference would result to existing FM systems. This conclusion assumes spread-spectrum transmitter powers comparable to existing FM systems. Landmobile operating frequencies of 150 and 900 MHz are considered. Also examined is the reverse problem of interference from FM to spread spectrum. Curves are prepared showing separation requirement for various channel multipath conditions. A computer simulation program is also described that simulates the operation of a spread-spectrum system in a multiple FM interferer environment. The conclusions are that an overlayed spread-spectrum system also would receive significant interference. A frequency hopping, spread-spectrum system is described that is programmed to miss those FM channels in use at a given locality. The advantages obtained with this technique are briefly discussed. GRA

N80-16269# National Telecommunication Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.
INVESTIGATION OF DIGITAL MICROWAVE COMMUNICATIONS IN A STRONG METEOROLOGICAL DUCTING ENVIRONMENT
R. W. Hubbard Aug. 1979 96 p refs Sponsored in part by Pacific Missile Test Center, Point Mugu, Calif.
(Contract MIPR-N-63126-78MP-31106)
(PB-301212/7; NTIA/REPT-79/24) Avail: NTIS
HC A05/MF A01 CSCL 17B

An experiment conducted over a LOS microwave link off the coast of southern California is described. The objective was to determine the effect of known anomalous propagating conditions, caused by persistent temperature inversions in the atmosphere on a wideband digital communications system. A channel probe was used to measure the effective impulse response of the transmission channel, and bit-error-rate measurements were made on the same probe test signal. In addition, a dual receiver was used to investigate the application of angle diversity on the reception of signals in this propagation environment. The results of the experiment indicate that the test link should, if properly configured, support digital transmission at a mission rate on the order of 50 Mb/s. Recommendations for implementing a digital system for the specific link are given. GRA

N80-16270# Federal Communications Commission, Washington, D. C. Office of Plans and Policy.
COMPARABILITY FOR UHF TELEVISION: A PRELIMINARY ANALYSIS Staff Report, Oct. 1978 - Sep. 1979
Steven R. Brenner, Philip B. Gieseler, Virginia D. Armstrong, and Alex D. Felker Sep. 1979 259 p refs
(PB-301267/1; FCC/OPP-79/02) Avail: NTIS
HC A12/MF A01 CSCL 17B

The evolution of television channel selectors on television receivers and their relevance to vidwing habits are examined. Channel selectors currently in use and their costs and technological capabilities are discussed, as well as current Commission regulations concerning acceptable types of channel selectors. The UHF picture quality handicap is analyzed. Signal behavior from the transmission system to the receiving system is examined. Poor picture quality occurring as a result of the interrelationships between television transmitters, receivers, and antenna systems is also discussed as well as the potential for improvements as a result of changes to one/or a combination of those components. GRA

N80-16271# National Bureau of Standards, Boulder, Colo. Electromagnetic Technology Div.
RADAR ABSORBER MEASUREMENT TECHNIQUES AT FREQUENCIES ABOVE 20 GHz Final Report
N. S. Nahman, C. M. Allred, J. R. Andrews, C. A. Hoer, and R. A. Lawton Aug. 1979 71 p refs Sponsored in part by AFAL, Wright-Patterson AFB, Ohio
(PB-299576/9; NBSIR-79-1613) Avail: NTIS
HC A04/MF A01

Methods for implementing automatic permittivity/permeability measurements of radar absorber materials for applications primarily above 20 GHz and into the millimeter wave region to about 100 GHz are discussed. A review of the state of the art of dielectric and magnetic material measurements is given. Automated time domain and frequency domain methods are considered including time domain automatic network analyzers, correlation measurement systems using noise signal sources, and six port network analyzers. GRA

N80-16272# Trans-Communications Corp., Greenwich, Conn.
THE INITIAL GROWTH AND EXPANDING OPPORTUNITIES OF US DOMESTIC SATELLITE SERVICE
H. J. Schlafly, R. E. Button, and B. L. Wormington Feb. 1979 160 p Sponsored by Dept. of Commerce
(PB-300438/9; NTIA/CR-79/3) Avail: NTIS
HC A08/MF A01 CSCL 17B

The growth is charted of U.S. Domestic Satellite Communications during the first years of earth terminal proliferation with emphasis on the compatibility of satellite and cable as a total communication system. The geostationary relay is shown to provide anywhere to everywhere communication for video distribution and for non-video services. The effects of favorable regulation and of continued improvement in terminal equipment are shown to have stimulated satellite usage. Recent growth is illustrated by an earth station index listed by state. Technical characteristics of satellite communications are reviewed, together with procedures for establishing earth terminal sites. The complexity of traffic scheduling is acknowledged as a stimulus for improvement of techniques and development of additional capacity. Opportunities for common carrier, private and shared use are examined. Current or proposed means for accomodating non-video services are described. Elements of digital transmission are examined. The need for interconnection with local distribution systems is described, with particular attention to broadband terrestrial systems. Cable television, private microwave systems and improved common carrier facilities are examined as possible means of supplying this need. GRA

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N80-16273 Colorado State Univ., Fort Collins. -
THEORETICAL AND EXPERIMENTAL SQUARE WAVE VOLTAMMETRY Ph.D. Thesis
John Joseph Odea 1979 129 p
Avail: Univ. Microfilms Order No. 7928537

The theory of square wave voltammetry was extended to include electron transfer kinetics, and first order preceding, following and catalytic reactions. The effects of these complications upon experimentally measurable peak positions, heights and widths were predicted by the numerical solution of the integral equations describing the systems. A fast scan square wave technique useful at frequencies up to 1250 Hz and scan rates of 6.25 volts per second was developed to test the theoretical predictions experimentally. A laboratory minicomputer interfaced to a static mercury drop electrode was used for data acquisition and real time control of the experiment. The quasireversible reduction of zinc, the dissociation of cadmium EDTA preceding electron transfer, the rearrangement of hydrazobenzene following electron transfer, and the catalytic reduction of titanium were chosen as model systems. Dissert. Abstr.

N80-16274 Yeshiva Univ., New York, N. Y.
PINCHED RELATIVISTIC ELECTRON BEAMS AND COLLECTIVE ACCELERATION OF IONS Ph.D. Thesis
Victor Serlin 1979 129 p
Avail: Univ. Microfilms Order No. 8001271

The collective acceleration of ions by a pinched relativistic electron beam is discussed. Two areas of relativistic electron beam research were investigated, electron beam pinch in the diode and the ion acceleration in an evacuated drift chamber. A 550 keV electron beam with peak current of 55 kA and of 50 nanoseconds duration, was produced in a high voltage diode.

designed specifically for a tight pinching of the electron beam. The characteristics of the electron beam pinch were investigated by means of X-ray pin hole photography, scintillator photography, current and energy measurements in the focal spot of the anode, and damage patterns on witness anode plates. The ion acceleration was studied by means of time analyzed current measurements, ion time of flight analysis, and calorimetry. Results are reported. Dissert. Abstr.

N80-16275 Yeshiva Univ., New York, N. Y.
DIELECTRIC AND PYROELECTRIC PROPERTIES OF FERROELECTRICS Ph.D. Thesis
Yuan-Huai Tsuo 1978 181 p
Avail: Univ. Microfilms Order No. 8001275

The dielectric and pyroelectric properties of ferroelectrics were studied by measuring the temperature and electric field dependence of their dielectric constants and pyroelectric coefficients. Three types of ferroelectrics, classified according to the nature of the order parameters describing their phase transitions, are included: (1) proper ferroelectrics in which the order parameter is the electrical polarization; (2) improper ferroelectrics, in which the order parameter is not the polarization, and the spontaneous polarization arises from a nonlinear coupling of the polarization to the order parameter; and (3) pseudoproper ferroelectrics, in which the order parameter is also not the polarization, but the coupling with the polarization is linear. It is shown that the small dielectric anomalies of improper and pseudoproper ferroelectrics yield an important advantage in infrared detection and pyroelectric energy conversion. But the large Curie constants of proper ferroelectrics are advantageous in thermodielectric energy conversion. Dissert. Abstr.

N80-16276 British Broadcasting Corp., Kingswood (England). Research Dept.
A STATISTICAL ANALYSIS FOR DIGITAL FIELD STRENGTH DATA
A. P. Robinson Nov. 1979 12 p refs
(BBC-RD-1979/24) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Digital equipment using a microprocessor is described which carries out a statistical analysis of field strength data as the measurements are made. The results are obtained immediately and are printed. The analyser is intended primarily for use with a measuring receiver in a vehicle but the report also discusses the scope for other applications. The equipment obtains results which used to be obtained by manual chart analysis, thus an increase in accuracy and speed, and a saving of effort, have been achieved. Author

N80-16277 California Univ., Berkeley.
ELECTROMAGNETIC SCATTERING BY TWO BODIES OF REVOLUTION Ph.D. Thesis
John Frank Hunka 1979 115 p
Avail: Univ. Microfilms Order No. 8000387

A systematic procedure for solving the two body of revolution scattering problem by interfacing with a unimoment program is presented. Spherical vector wave function expansions and addition theorems were investigated. A scatter-independent, modal incident field formulation was developed as a means of interfacing the multiple scattering and unimoment programs. Also, an experimental scattering measurement system was used for the verification of the multiple scattering computations. The verification of the multiple scattering program both numerically and experimentally is discussed in depth. Selected case studies of two body configurations are presented to demonstrate the utility of the program and to lay a foundation for future study and analysis. Dissert. Abstr.

N80-16278# Office of Naval Research, Arlington, Va. Metallurgy and Ceramics Program.
CARBON FIBER ELECTRICAL RESISTANCE MODIFICATION, ITS RELATIONSHIP TO ELECTRICAL EQUIPMENT MALFUNCTION Final Report
1 Sep. 1978 18 p ref Supplement to GIDEP-E134-1524. (AD-A074656; GIDEP-E134-1623) Avail: NTIS HC A02/MF A01 CSCL 09/1

This study relates to hazards in the operation of electrical equipment by carbon fibers which come in contact with critical electrical circuits when accidentally dispersed into the air by a variety of means. A carbon Fiber Study Group was convened to consider: (1) the magnitude of resistance changes required to minimize electrical malfunction, (2) whether or not carbon fibers can be modified to meet these requirements, (3) the ease of hardening confined spaces, and (4) the disposal of carbon fibers and composites after use. Conclusions, recommendations, and background information are presented. GRA

N80-16279# Office of Naval Research, Arlington, Va.
CARBON FIBER ELECTRICAL RESISTANCE MODIFICATION, ITS RELATIONSHIP TO ELECTRICAL EQUIPMENT MALFUNCTION Final Report
1 Sep. 1978 64 p refs Supplement to GIDEP-E134-1623 (AD-A074655; GIDEP-E134-152421) Avail: NTIS HC A04/MF A01 CSCL 09/1

The problem of carbon fibers which come in contact with critical electrical circuits when accidentally dispersed into the air is examined. A Carbon Fiber Study Group was convened to consider whether or not the electrical resistance of carbon fibers could be increased to acceptable levels without altering other desirable characteristics. The group considered: (1) the magnitude of resistance changes required to minimize electrical equipment malfunction; (2) whether or not carbon fibers can be modified to meet these requirements; (3) the ease of hardening confined spaces; and (4) the disposal of carbon fibers and composites after use. GRA

N80-16280# Westinghouse Research Labs., Pittsburgh, Pa. Electrotechnology Dept.
AN EVALUATION OF DIRECT CURRENT ELECTROMAGNETIC PROPULSION IN SEAWATER Final Report, Jan. - May 1979
George T. Hummert Aug. 1979 83 p refs
(Contract N00014-78-C-0667; RF32391801)
(AD-A074830; Rept-79-982-EMSUB-R1; ONR-CR-168-007-1)
Avail: NTIS HC A05/MF A01 CSCL 13/10

Electromagnetic seawater thrusters may be classified in one of three general categories: internal duct dc, external field dc, and peristalic ac. Internal duct dc thruster offers the advantages of low magnetic field leakage, simple construction, and potentially high reliability. The most efficient internal duct configuration consists of a converging inlet nozzle and a straight discharge duct. Ideal efficiency calculations based on the one-dimensional Bernoulli equation show that thrusters should be designed with large cross-sectional areas and operate at low discharge velocities. In practice, this may be accomplished by using multiple thruster ducts. Conductivity enhancement, high magnetic fields, and long electrodes also improve efficiency. While the magnetic field-volume requirements for a thruster capable of propelling full-size (2000 ton displacement) submarines appear beyond the present technology, it may be feasible to use superconducting magnets to build high efficiency, internal duct thrusters capable of maneuvering small (approx. 10 ton displacement) submersibles. GRA

N80-16281# Argonne National Lab., Ill.
SUPERCONDUCTING NOTCH FILTER
C. S. Pang, C. M. Falco, R. T. Kampwirth, I. K. Schuller, J. J. Hudak, and T. A. Anastasio 1979 17 p refs Presented at the Cryog. Eng. Conf., Madison, Wis., 21 Aug. 1979
(Contract W-31-109-eng-38)
(CONF-790815-23) Avail: NTIS HC A02/MF A01

Results of a preliminary investigation of a superconducting notch filter for possible application in the 2 to 30 MHz high frequency (HF) communication band are presented. The circuit was successfully implemented using planar geometry so that closed cycle refrigeration could be used to cool circuits fabricated from high T sub c/Nb3Sn or Nb3Ge thin films. In the present design, circuit Q's of about 2000 were obtained with 50-ohm source and output impedance (TFD). DOE

N80-16282# Brookhaven National Lab., Upton, N. Y.
ALTERATION OF THE SUPERCONDUCTING PROPERTIES OF A15 COMPOUNDS AND ELEMENTARY COMPOSITE SUPERCONDUCTORS BY NON-HYDROSTATIC ELASTIC STRAIN
D. O. Welch 1979 35 p refs Presented at the Cryogenic

Eng. Conf., Madison, Wis., 21 Aug. 1979
(Contract EY-76-C-02-0016)
(BNL-26400; CONF-790815-10) Avail: NTIS HC A03/MF A01

The effects of elastic strains on the critical temperatures, magnetic fields, and current densities of superconducting A15 compounds are considered including nonhydrostatic strain states. The experimental evidence, obtained by a variety of techniques, concerning the strain dependence of the critical properties of a number of A15 compounds is reviewed. Theoretical models for describing such effects are discussed. DOE

N80-16283# California Univ., Livermore. Lawrence Livermore Lab.
ELECTROSTATIC FILTERS GENERATED BY ELECTRIC FIELDS
W. Bergman, H. Hebard, R. Taylor, and B. Lum 23 Jul. 1979 31 p refs Presented at the World Filtration Congr., London, 18 Sep. 1979
(Contract W-7405-eng-48)
(UCRL-81926; CONF-790907-1) Avail: NTIS HC A03/MF A01

The theoretical and experimental findings on fibrous filters converted to electrostatic operation by a nonionizing electric field are presented. Compared to a conventional fibrous filter, the electrostatic filter has a much higher efficiency and significantly lower pressure drop at the same level of particle loading. Two theoretical models of filter clogging are presented. The dendrite model simulates filter clogging of conventional fibrous filter without an electric field and the increasing fiber model simulates filter clogging with an applied electric field. DOE

N80-16284# United Technologies Corp., South Windsor, Conn. Power Systems Div.
AN ac/dc POWER CONVERTER FOR BATTERIES AND FUEL CELLS Annual Report
Ramon W. Rosati, ed. Aug. 1978 98 p refs Sponsored by Elec. Power Res. Inst.
(EPRI-EM-662) Avail: NTIS HC A05/MF A01

The overall objective of the EPRI program is the design of an advanced power converter for use in both battery energy storage and fuel cell generation systems. This will be accomplished by expansion of the existing FCG-1 fuel cell power conditioning inverter into a high-efficiency inverter-rectifier system employing improved commutation circuits and advanced semiconductor devices capable of operating over wider dc voltage ranges. A separate but concurrent program for the U. S. Department of Energy (DOE) is examining augmentation of the present FCG-1 inverter for operation as an inverter-rectifier with battery systems; feasibility and operating characteristics were demonstrated. Activities ahp accomplishments in the EPRI program include revision of the preliminary specification for ac/dc conversion equipment, survey of seven semiconductor manufacturers to project characteristics of thyristors, screening of fifteen commutation concepts and selection of the two most promising options for experimental evaluation, and modifications of existing experimental power pole hardware to evaluate the selected advanced commutation circuits. DOE

N80-16285# General Electric Co., St. Petersburg, Fla.
IMPROVING THE VOLTAGE HOLDOFF PERFORMANCE OF ALUMINA INSULATORS IN VACUUM THROUGH QUASI-METALLIZING
H. Craig Miller 6 Aug. 1979 24 p refs
(Contract EY-76-C-04-0656)
(GEPP-TIS-441) Avail: NTIS HC A02/MF A01

Treatment of the surface of an alumina insulator with coatings incorporating varying amounts of Cr, Mn, and Ti was examined for increasing the vacuum voltage holdoff capability of the insulator. During processing (quasimetallizing) the coating penetrates into the alumina, so it is insensitive to mechanical damage. The quasimetallizing treatment and the effectiveness of each metal and the metal mixes toward improving the voltage holdoff capability of alumina are reported. Quasimetallizing with appropriate formulations were shown to change the surface characteristics of alumina in two ways: it decreases the surface resistivity of the alumina, and it decreases the secondary electron emission yield of the alumina. DOE

N80-16286# Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
SHAFT TORSIONAL OSCILLATIONS OF HYDROGENERATORS
L. E. Eilts and Eugene Campbell Aug. 1979 30 p
(PB80-102155; REC-ERC-79-6) Avail: NTIS HC A03/MF A01 CSCL 10B

The efforts to analyze, model, and instrument the shaft torsional oscillations of electric generators are described. The mechanics of the shaft torsional modes are presented through the defining analytical equations from which block diagram and analog computer representation of shaft torsional systems were developed. Results of an analog study of the torsional mode of a hydrogenerator as well as calculated data are presented. An instrumentation system which employs shaft-mounted strain gages to provide a torsional signal was developed for direct field measurement of the torsional behavior of hydrogenerator shafts. The design and circuit configuration of that instrumentation system are presented. GRA

N80-16287# National Bureau of Standards, Washington, D.C. National Engineering Lab.
SEMICONDUCTOR MEASUREMENT TECHNOLOGY: NONDESTRUCTIVE TESTS USED TO INSURE THE INTEGRITY OF SEMICONDUCTOR DEVICES, WITH EMPHASIS ON ACOUSTIC EMISSION TECHNIQUES Final Report
George G. Harman Sep. 1979 76 p refs
(ARPA Order 2397)
(PB80-101801; NBS-SP-400-59; LC-79-600131) Avail: NTIS HC A05/MF A01 CSCL 09A

Device assembly techniques and problems are discussed followed by a review of six important nondestructive tests used during and after device packaging to insure the mechanical integrity of completed electronic devices. The economic and other factors that result in the choice of one screen over another and to production line statistical sampling (LTPD) appropriate to special high reliability device lots such as those used for space flight are included. The status of theory of acoustic emission as it can be applied to microelectronics is discussed. Passive AE techniques are applied to establishing the mechanical bond integrity of beam lead, flip chip, and tape-bonded integrated circuits as well as components in hybrid microcircuits. GRA

N80-17017# Joint Publications Research Service, Arlington, Va.
DEVICES FOR MANUFACTURE OF MICROSTRUCTURES, CHIPS DESCRIBED
K.-W. Gommel *In its* E. Europe Rept.: Sci. Affairs, No. 659 (JPRS-74911) 11 Jan. 1980 p 58-74 Transl. into ENGLISH from Feingeraetetech. (E. Berlin), v. 28, no. 10, 1979 p 446-450
(For primary document see N80-17015 07-99)
Avail: NTIS HC A07/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N80-16288 Engineering Sciences Data Unit, London (England).
LOSSES CAUSED BY FRICTION IN STRAIGHT PIPES WITH SYSTEMATIC ROUGHNESS ELEMENTS
1979 44 p
(ESDU-79014; ISBN-0-85679-258-6) For information on availability of series, sub-series, or individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $770.50

Data for calculating the pressure drop due to friction for the flow of fluids in straight pipes containing systematic roughness elements is provided. The data is applicable to the calculation of pressure drop in pipes containing roughness elements, such as welds at pipe joints, or artificially introduced elements to increase heat transfer to or from the fluid. The developed calculations may be applied for both heating and cooling of

gases and liquids in pipes of circular section containing transverse ribs, helical threads, longitudinal fins, or three dimensional roughness arrays, and also to pipes of rectangular or annular section containing a more limited range of roughness element types. ESDU (GRA)

N80-16289 Brigham Young Univ., Provo, Utah.
TRANSITIONAL FLOW IN AN ANNULUS Ph.D. Thesis
James Max Peterson 1979 165 p
Avail: Univ. Microfilms Order No. 8000087

Fully developed laminar, transitional and turbulent flow of a Newtonian fluid in an annulus of diameter ratio 0.0415 was investigated. Measurements were made of the axial pressure gradient, turbulence intensity, velocities, location of the point of maximum velocity. A range of Reynolds numbers (based on the diameter difference and mass flow rate) from 750 to 130,000 was covered. It was shown that the mean velocity profiles were not rectilinear laminar, were fully developed axially, and varied with the angular position around the annulus indicating a complex laminar flow. Composite pipe measurements show that when a fully developed Poiseuille pipe flow is subjected to several types of disturbance, the transition behavior of the stream depends upon whether the stream impinging upon the disturbance source is itself laminar or turbulent. Dissert. Abstr.

N80-16290 Iowa State Univ. of Science and Technology, Ames.
STABILITY ANALYSIS OF INTERFACIAL CIRCULATION ON A STATIC LIQUID DROP WITH FORCED INTERNAL CIRCULATION Ph.D. Thesis
Soo Bong Joo 1979 181 p
Avail: Univ. Microfilms Order No. 8000142

A hemispherical constant volume drop with forced internal circulation was considered as a model approximating a real drop at a similar stage of formation. It was proposed that the ordered flow patterns of interfacial circulation observed experimentally on the surface of such a drop are a manifestation of hydrodynamic instability, which was affected by internal flow conditions within the drop and by the properties of the interface. A simplified mathematical model was analyzed in order to detail the mechanism for the onset of interfacial circulation from a non-circulatory basic state. Dissert. Abstr.

N80-16291 Stanford Univ., Calif.
NATURAL CONVECTION IN A VERTICAL CHANNEL WITH HEAT AND MASS TRANSFER AND FLOW REVERSAL Ph.D. Thesis
Tsong-Sheng Lee 1979 175 p
Avail: Univ. Microfilms Order No. 8001957

The time-dependent, variable-property governing equations together with the assumed boundary conditions at the channel entrance and exit are solved by using an implicit finite-difference method. Steady-state solutions are obtained for Grashof numbers, GT, up to 700, and channel height-to-width ratios, 10 and 16, over a range of injected mass fluxes of CO2. Particular attention is given to the effects of the reverse flow on the heat and mass transfer, and graphical results are presented. Mach-Zehnder interferometer and a traversing thermocouple probe were used simultaneously to determine the profiles of temperature and mass concentration in the channel. Results of the measurements are presented and assessed. Experimental results were also obtained for the stability characteristics of the reverse flow, and are presented graphically. Dissert. Abstr.

N80-16292 Stanford Univ., Calif.
AN EXPERIMENTAL STUDY OF MULTIPLE JET MIXING Ph.D. Thesis
Anjaneyulu Krothapalli 1979 166 p
Avail: Univ. Microfilms Order No. 8001955

Results of hot-wire measurements in an incompressible jet issuing from an array of rectangular lobes, equally spaced with their small dimensions in a line, both as a free jet, and as a confined jet, are presented. The quantities measured include mean velocity and the Reynolds stress in the two central planes of the jet at various stations downstream of the nozzle exit. In the case of a single rectangular free jet, the flow field of the jet is found to be characterized by the presence of three distinct regions in the axial mean velocity decay. In the case of a multiple free jet, the flow field for downstream distance X greater than 60D (D = width of a lobe) resembles that of a jet exiting from a two dimensional nozzle with its short dimension being the long dimension of the lobe. In case of a confined multiple jet the flow field is observed to be nearly homogeneous and isotropic for X greater than 60D. Dissert. Abstr.

N80-16293 Utah Univ., Salt Lake City.
THE EFFECT OF SUPERHEATING ON THE PERFORMANCE OF FLOATING DROPLET DIRECT CONTACT HEAT EXCHANGERS Ph.D. Thesis
Calvin Albert Kodres, Jr. 1979 174 p
Avail: Univ. Microfilms Order No. 8000972

A mathematical model of a single evaporating, superheated droplet is formulated and studied numerically to determine instantaneous and average heat transfer rates to the droplet at various stages of evaporation. An explicit procedure for analyzing the entire heat exchanger is then developed based upon the application of a dimensional analysis derivation of a relationship for the heat flux from the single evaporating droplet. The results of the numerical model are used to define the parameters and determine the required constants. Two operating geothermal heat exchangers are designed using this procedure. The two sites both have a moderate temperature brine and both systems utilize pentane as the working fluid. The heat exchanger vessel pressures are varied, providing a range of superheats from 19 to 52 C. The average difference between the calculated and measured total heat flux is about 16%. Dissert. Abstr.

N80-16294*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
EFFECT OF STREAMWISE VORTICES ON TOLLMIEN-SCHLICHTING WAVES
Ali H. Nayfeh Mar. 1979 20 p refs
(Grant NsG-1255; Contract N00014-75-C-0381)
(NASA-CR-162654; VPI-E-79.12) Avail: NTIS HC A02/MF A01 CSCL 20D

The method of multiple scales is used to determine a first order uniform expansion for the effect of counter rotating steady streamwise vortices in growing boundary layers on Tollmien-Schlichting waves. The results show that such vortices have a strong tendency to amplify three dimensional Tollmien-Schlichting waves having a spanwise wavelength that is twice the wavelength of the vortices. An analytical expression is derived for the growth rates of these waves. These growth rates increase linearly with increasing amplitudes of the vortices. Author

N80-16295# Argonne National Lab., Ill. Engineering and Mechanics Section.
EVALUATION OF LAGRANGIAN, EULERIAN, ARBITARY LAGRANGIAN-EULERIAN METHODS FOR FLUID-STRUCTURE INTERACTION PROBLEMS IN HCDA ANALYSIS
Y. W. Chang, H. Y. Chu, and C. Y. Wang 1979 16 p refs
Presented at 5th SMIRT Conf., Berlin, 13-17 Aug. 1979
(Contract W-31-109-eng-38)
(CONF-790802-55) Avail: NTIS HC A02/MF A01

The analysis of fluid-structure interaction involved the calculation of both fluid transient and structure dynamics. In the structural analysis, Lagrangian meshes were used exclusively, whereas for the fluid transient, Lagrangian, Eulerian, and arbitrary Lagrangian-Eulerian meshes were used. An evaluation on these three types of meshes is presented with emphasis on the applicability of the method in analyzing fluid-structure interaction problems in hypothetical core disruptive accident analysis. DOE

N80-16296*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
NONPARALLEL STABILITY OF THREE-DIMENSIONAL COMPRESSIBLE BOUNDARY LAYERS. PART 1: STABILITY ANALYSIS Final Report
Nabil M. El-Hady Feb. 1980 38 p refs
(Grant NsG-1645)
(NASA-CR-3245) Avail: NTIS HC A03/MF A01 CSCL 20D

A compressible linear stability theory is presented for nonparallel three-dimensional boundary-layer flows, taking into account the normal velocity component as well as the streamwise and spanwise variations of the basic flow. The method of multiple scales is used to account for the nonparallelism of the basic

flow, and equations are derived for the spatial evolution of the disturbance amplitude and wavenumber. The numerical procedure for obtaining the solution of the nonparallel problem is outlined. Author

N80-16297*# Systems and Applied Sciences Corp., Riverdale, Md.
ANALYTICAL AND DESIGN TECHNIQUES FOR DRAG REDUCTION STUDIES ON WAVY SURFACES Final Report
R. Balasubramanian Jan. 1980 22 p refs
(Contract NAS1-15278)
(NASA-CR-3225) Avail: NTIS HC A02/MF A01 CSCL 20D

Numerical models for two dimensional turbulent boundary layers over wavy surfaces were investigated. Computations for wavy wall boundary layers indicate possibilities of overall drag reduction in a parameter range of the geometry of the wall. The correction technique using integral methods for analyzing arbitrary surfaces was found to be unsuitable for some cases of interest in drag reduction; a Navier-Stokes solver for wavy walls was built to test these problems. Test results of the Navier-Stokes solver indicate that the solution techniques are accurate enough to handle complex geometries and steep variations in fluid properties. Author

N80-16298*# Stanford Univ., Calif.
EVOLUTION OF WEAK DISTURBANCES IN INERT BINARY MIXTURES
M. L. Rasmussen Aug. 1977 32 p refs Sponsored in part by NASA
(NASA-TM-80925; SU-JIAA-TR-6) Avail: NTIS HC A03/MF A01 CSCL 20D

The evolution of weak disturbances in inert binary mixtures is determined for the one-dimensional piston problem. The interaction of the dissipative and nonlinear mechanisms is described by Burgers' equation. The binary mixture diffusion mechanisms enter as an additive term in an effective diffusivity. Results for the impulsive motion of a piston moving into an ambient medium and the sinusoidally oscillating piston are used to illustrate the results and elucidate the incorrect behavior pertaining to the associated linear theory. Author

N80-16299*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HOMOGENEOUS VORTEX MODEL FOR LIQUID SLOSH IN SPINNING SPHERICAL TANKS
Michael El-Raheb and Paul Wagner 15 Nov. 1979 46 p refs
(Contract NAS7-100)
(NASA-CR-162725; JPL-Pub-79-99) Avail: NTIS HC A03/MF A01 CSCL 20D

The problem of forced fluid sloshing in a partially filled spinning spherical tank is solved numerically using the finite element method. The governing equations include Coriolis acceleration, empirical fluid damping and spatially homogeneous vorticity first introduced by Pfeiffer. An exponential instability similar to flutter is detected in the present simulation for fill ratios below 50 percent. This instability appears in the model as a result of the homogeneous vortex assumption since the free slosh equations are neutrally stable in the Liapunov sense. Author

N80-16300*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TURBULENCE MEASUREMENTS IN THE BOUNDARY LAYER OF A LOW-SPEED WIND TUNNEL USING LASER VELOCIMETRY
Edward T. Schairer Feb. 1980 25 p refs
(NASA-TM-81165; A-8058) Avail: NTIS HC A02/MF A01 CSCL 20D

Laser velocimeter measurements in an incompressible, turbulent boundary layer along the wall of a low-speed wind tunnel are presented. The laser data are compared with existing hot-wire anemometer measurements of a flat plate, incompressible, turbulent, boundary layer with zero pressure gradient. An argument is presented to explain why previous laser velocimeter measurements in zero pressure gradient, turbulent boundary layers have shown an unexpected decrease in turbulent shear stresses near the wall. M.M.M.

N80-16301# Stanford Univ., Calif. Dept. of Mechanical Engineering.
INSTRUMENTATION FOR THE MEASUREMENT OF TURBULENCE COMPONENTS IN A THREE-DIMENSIONAL FLOW FIELD Final Report, 1 May - 30 Nov. 1978
M. Frota and R. J. Moffat Aug. 1979 76 p refs
(Grant AF-AFOSR-3597-78; AF Proj. 2307)
(AD-A073954; AFOSR-79-0957TR) Avail: NTIS HC A05/MF A01 CSCL 20/4

A three-coordinate hot-wire anemometer system for turbulence measurements has been implemented for use in three-dimensional flows. High-speed analog processing produces the turbulence data in real time, including all double correlations. A 2 mm diameter miniature probe has been developed. The system has been tested in reference flows and used in a curved boundary layer. GRA

N80-16302# Minnesota Univ., Minneapolis. Hydraulic Lab.
AN EXPERIMENTAL INVESTIGATION OF THE EFFECT OF DRAG REDUCING POLYMER ADDITIVES ON SURFACE PRESSURE FLUCTATIONS ON BODIES OF REVOLUTION WITH ROUGH SURFACES MOVING THROUGH WATER Final Report, 1 May 1977 - 30 Apr. 1978
Edward Silberman May 1978 40 p refs
(Contract N00014-77-C-0356; SR-230101)
(AD-A073836; Rept-172) Avail: NTIS HC A03/MF A01 CSCL 20/4

A sound detector in the surface of a moving body receives not only sound signals radiated from a distant source but also detects pressure fluctuations originating in the turbulent boundary layer of the fluid surrounding the body. The purpose of the present work was to assess the magnitude of the surface pressure fluctuations on a body moving in water and in water with polymer additive under nearly zero pressure gradient conditions. Measurements were made using a single transducer in the surface of an axi-symmetric body. Both smooth and grit-roughened surfaces were used. Mean square pressure fluctuation amplitudes were measured as a function of frequency, non-dimensionalized, plotted, and compared with some results obtained by others in both water and air. It was concluded that the addition of roughness to a smooth surface increases the amplitude at the peak of the spectrum and at all lower frequencies. Polymer additive in the water has just the opposite effect on a rough-surfaced body, decreasing the amplitude at the peak and at all lower frequencies, the reduction increasing monotonically with drag reduction. There was little or no effect at high frequencies attributable to either roughness or polymer additive, but it must be noted that the transducer used was too large to obtain a true measure of amplitude at the highest frequencies. The peak of the spectrum in water appears to have a somewhat higher amplitude than it does in air. GRA

N80-16303# Argonne National Lab., Ill.
VAPOR LOCKING AND HEAT TRANSFER UNDER TRANSIENT AND STEADY STATE CONDITIONS
C. J. Chen, S. T. Wang, and J. W. Dawson 1979 18 p refs Presented at the Cryogenic Eng. Conf., Madison, Wis., 21 Aug. 1979
(Contract W-31-109-eng-38)
(CONF-790815-19) Avail: NTIS HC A02/MF A01

The vapor locking in the cooling channels of a cryostable superconducting magnet is studied. The heat transfer characteristics under steady state and transient conditions, and the effects of vapor accumulation of the multiple coil layers are investigated. The critical steady state heat flux for the transition from nucleate boiling to film boiling is reported along with the critical transient energy density for the boiling transition. DOE

N80-16304# Knolls Atomic Power Lab., Schenectady, N. Y.
BOUNDARY CONDITIONS FOR FLOW COMPUTATION WITH NONORTHOGONAL CURVILINEAR COORDINATES
P. F. Muro and E. L. Wachspress Jul. 1979 14 p refs Presented at the Am. Soc. of Mech. Engr. Winter Ann. Meeting, New York, 2 Dec. 1979
(Contract EY-76-C-12-0052)
(KAPL-4123; CONF-791205-4) Avail: NTIS HC A02/MF A01

The manner in which boundary conditions are handled at

walls and at channel inlet and outlet was incorporated in the equations derived to determine the flow with nonorthogonal curvilinear coordinates. DOE

N80-16305# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
SCALING OF SOME FLOWFIELDS WITH FLAMES
F. V. Bracco 1978 49 p refs Presented at the Intern. Symp. on Combustion Modeling in Reciprocating Engines, Warren, Mich., 6 Nov. 1978
(Contract EC-77-S-02-4191)
(CONF-7811102-2) Avail: NTIS HC A03/MF A01

A mathematical model for flow fields with flames is developed and applied to the combustion kinetics of internal combustion engines. DOE

N80-16306# Argonne National Lab., Ill. Engineering Mechanics Section.
QUASI-EULERIAN FORMULATION FOR FLUID-STRUCTURE INTERACTION
J. M. Kennedy, T. Belytschko, and D. F. Schoeberle 1979 20 p refs Presented at the Intern. Conf. on Structural Mechanics in Reactor Technology, Berlin, 13 Aug. 1979
(Contract W-31-109-eng-38)
(CONF-790802-66) Avail: NTIS HC A02/MF A01

A quasi-Eulerian finite element formulation used for the treatment of the fluid in fluid-structure interaction problems is described. The present formulation is applicable both to plane two dimensional and axisymmetric three dimensional problems. The application of the method is illustrated in two problems: a two dimensional model of a cross section of a subassembly configuration, where the quasi-Eulerian formulation is used to model the fluid adjacent to the structures and in the channel between the subassemblies; and pressure transients in a straight pipe, where the axisymmetric formulation is used to model the fluid in the pipe. DOE

N80-16307# California Univ., Livermore. Lawrence Livermore Lab.
TURBULENT DUSTY GAS MOTIONS WITH WEAK STATISTICAL COUPLING
Alfred C. Buckingham 17 May 1979 22 p refs Presented at the AIAA Fluid and Plasma Dyn. Conf., Williamsburg, Va., 24 Jul. 1979
(Contract W-7405-eng-48)
(UCRL-82131; CONF-790704-1) Avail: NTIS HC A02/MF A01

Computer simulations were used to describe the random motions and resulting dispersal of gas borne particulates in turbulent internal ballistics flow. Force, energy and motion coupling between particles and gas was assumed weak, with negligible back influence from particles to gas flow structure. Individual particle to gas relative velocities were obtained at incremental time steps by randomization subject to the constraint that their ensemble averaged motions were consistent with the locally computed turbulent intensity. Influence of the particles on turbulent transport and wall erosion is discussed. DOE

N80-16308# Union Carbide Corp., Oak Ridge, Tenn. Nuclear Div.
APPLICATION OF THE FINITE ELEMENT METHOD TO THE NONLINEAR INVERSE HEAT CONDUCTION PROBLEM USING BECK'S SECOND METHOD
B. R. Bass 1978 44 p refs Presented to the ASME Meeting, San Francisco, Calif., 10 Dec. 1978
(Contract W-7405-eng-26)
(K/CSD/INF-78/20; CONF-781202-16) Avail: NTIS HC A03/MF A01

The application is presented of a solution technique for the inverse problem that utilizes a finite element heat conduction model and Beck's nonlinear estimation procedure. The technique is applicable to the one-dimensional nonlinear model with temperature-dependent thermophysical properties. The formulation is applied first to a numerical example with a known solution. The example treated is that of a periodic heat flux imposed on the surface of a rod. The computed surface heat flux is compared with the imposed heat flux to evaluate the performance of the technique in solving the inverse problem. Finally, the technique is applied to an experimentally determined temperature transient taken from an interior point of an electrically-heated composite rod. The results are compared with those obtained by applying a finite difference inverse technique to the same data. DOE

N80-16309# Los Alamos Scientific Lab., N. Mex.
CATALOG OF TWO-DIMENSIONAL VORTEX PATTERNS
L. J. Campbell and R. Ziff Oct. 1978 42 p refs
(Contract W-7405-eng-36)
(LA-7384-MS) Avail: NTIS HC A03/MF A01

The two dimensional patterns that correspond to minima in the free energy of identical parallel vortices inside a rotating cylinder of liquid such as superfluid He-4 are listed. All known stable patterns are listed for N = 1,2,..., 30, 37, 50, where N is the number of vortices. The two lowest energy patterns are shown for all triangular numbers, $N = 1+6(1+2+3+...)$, through N = 216. For each value of N the different patterns are ordered according to their relative free energy. DOE

N80-16310# Du Pont de Nemours (E. I.) and Co., Aiken, S. C. Savannah River Lab.
NUMERICAL SOLUTION OF THREE-DIMENSIONAL NATURAL CONVECTION BY THE STRONGLY IMPLICIT PROCEDURE
D. W. Pepper and S. D. Harris 1978 13 p refs Presented at the ASME Meeting, San Francisco, 10 Dec. 1978
(Contract EY-76-C-09-0001)
(DP-MS-78-14; CONF-781202-3) Avail: NTIS HC A02/MF A01

A numerical model was developed to solve three-dimensional laminar flow in enclosures. The model is based on a three-dimensional strongly implicit procedure. In simple cases of natural convection due to differential side heating, numerical results at low and moderate Rayleigh numbers agree with results appearing in the literature. Although the model requires a moderate amount of computer storage, computation times are relatively fast. The simple case of heating a cubical room by a uniform floor or ceiling heat system with a vertical wall exposed to a uniformly cooled surface is also investigated. DOE

N80-16311# Iowa State Univ. of Science and Technology, Ames. Heat Transfer Lab.
PREDICTION OF LAMINAR AND TURBULENT FLOW HEAT TRANSFER IN ANNULAR PASSAGES
M. R. Malik and R. H. Pletcher Mar. 1979 285 p refs
(Grant NSF ENG-74-22193)
(PB-299867/2; ISU-ERI-AMES-79099) Avail: NTIS HC A13/MF A01 CSCL 20D

A finite difference numerical procedure for treating variable property laminar and turbulent convective heat transfer in straight annular passages is presented. The calculation scheme is evaluated for both laminar and turbulent flow including laminar upward forced flow with buoyancy. Models using an ordinary differential equation for the transport of mixing length scale in the outer part of the flow and employing a transport equation for turbulence kinetic energy are considered. Predictions are compared to experimental data. The experimentally observed nonmonotonic development of centerline velocity and other flow parameters in a plane duct are well predicted by the model using the transport equation for length scale. GRA

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N80-16312 British Broadcasting Corp., Kingswood (England).
DIGITAL RECORDING USING HOLOGRAM ARRAYS: SOME INITIAL EXPERIMENTS IN 100 M bit/s RECORDING

K. Hacking and J. L. Riley Nov. 1979 20 p refs
(BBC-RD-1979/23) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The construction of an experimental holographic recorder has advanced sufficiently to carry out some initial experiments and to obtain some sample recordings of hologram tracks written on continuously moving photographic film. The hologram exposures and data transfer rates were commensurate with those values required for digital television recording. Careful analysis of the reconstructed hologram images from the test recordings has revealed some problems associated with the film and its processing for this application. The results have also directed attention to several critical areas of the proposed system and underlined the deficiencies still remaining in the principal transducers such as the page-composer and the digital light-deflector. Author

N80-16313*# National Aeronautics and Space Administration. Pasadena Office, Calif.
FARADAY ROTATION MEASUREMENT METHOD AND APPARATUS Patent Application
Milton H. Brockman, inventor (to NASA) (JPL) Filed 21 Dec. 1979 19 p
(Contract NAS7-100)
(NASA-Case-NPO-14839-1; US-Patent-Appl-SN-106119) Avail: NTIS HC A02/MF A01 CSCL 14B

A Faraday measuring apparatus utilized in conjunction with the specific receiver array provides a means for comparing the phase of a reference signal in the receiver array to the phase of a tracking loop signal related to the incoming signal, and comparing the phase of the reference signal to the phase of the tracking signal shifted in phase by 90 degrees. NASA

N80-16314# Brookhaven National Lab., Upton, N. Y.
THERMOLUMINESCENCE DATING APPARATUS EFFICIENCY MEASUREMENT USING A STANDARD LIGHT SOURCE
G. W. Carriveau (Metropolitan Museum of Art, New York) 1978 11 p
(Contract EY-76-C-02-0016)
(BNL-24525) Avail: NTIS HC A02/MF A01

The thermoluminescence apparatus, designed to improve upon light collection and transmission properties in relation to current dating systems, is evaluated. Two methods of light collection, one employing atmospheric reflectors and the other using a reflector and lens system are described. In order to compare the relative effectiveness of these two systems, and to compare their performance against theoretical predictions or future improvements, a standard lamp and housing were developed and calibrated. Two types of miniature lamps were evaluated for this purpose. Their characteristics are presented. DOE

N80-16315# Mitre Corp., McLean, Va. Metrek Div.
PRELIMINARY EVALUATION OF COMMERCIAL CONTINUOUS INSTRUMENTATION FOR THE MEASUREMENT OF VISCOSITY AND COAL CONCENTRATION OF COAL-OIL MIXTURES (COM)
A. J. Sabadell Oct. 1978 59 p refs
(Contract EX-76-C-01-2453)
(HCP/T2463-03) Avail: NTIS HC A04/MF A01

Several alternative commercial instruments for continuous monitoring of viscosity and suspended solids concentration are evaluated in terms of their applicability to the needs of the ongoing Coal-Oil Mixture (COM) Program. For viscosity measurements the rotational type instrument is preferred. For coal concentration measurements the gamma radiation and the sonic types are essentially equal in terms of capability. The results obtained with the latter are promising. Nevertheless, the most promising instruments as well as the others discussed should be tested more extensively before final selection is made. DOE

N80-16316# National Bureau of Standards, Washington, D.C.
NBS INTERAGENCY TRANSDUCER PROJECT: AN OVERVIEW, 1951 - 1979 Final Report
Paul S. Lederer Aug. 1979 50 p refs
(PB-300369/6; NBS-TN-1110) Avail: NTIS HC A03/MF A01 CSCL 14B

The performance of sensory transducers primarily those used in telemetry was studied. The background and history of the project, its objectives, the techniques and specialized facilities developed and used, and of some of the publications that were issued from the project are described. GRA

N80-16317# Arizona Dept. of Transportation, Phoenix.
OPTICAL SIEVE COMPARATOR DEVELOPMENT PROJECT Final Report, Jun. 1978 - Jun. 1979
Gene Poluianov and Frank P. Mancini Jun. 1979 84 p
(PB-300472/8; FHWA/AZ-78/14) Avail: NTIS HC A05/MF A01 CSCL 14B

The development of an optical sieve comparator for the measurement and certification of sieve conformance to specifications is described. The comparator features: (1) measurement of a wide range of mesh sizes (3/8 in. to no. 400); (2) GO/NO GO sampling for spotcheck statistical certification; (3) absolute measurement; (4) simple calibration procedures; (5) variable optical path distance for wide range magnification; (6) folded optical path; (7) visual resolution and repeatability to 1.5 microns; (8) individual precision viewing reticles for each sieve mesh size; (9) rapid and convenient operation. GRA

N80-16318# National Technical Information Service, Springfield, Va.
HOT FILM ANEMOMETRY. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1964 - Jul. 1979
Guy E. Habercom, Jr. Sep. 1979 63 p Supersedes NTIS/PS-78/0879; NTIS/PS-77/0793; NTIS/PS-76/0731; NTIS/PS-75/664
(NTIS/PS-79/0909/6; NTIS/PS-78/0879; NTIS/PS-77/0783; NTIS/PS-76/0731; NTIS/PS-75/664) Avail: NTIS HC $28.00/MF $28.00 CSCL 14B

The principles of hot film anemometer operation are summarized. Wind tunnel and laboratory tests are described. Flow field dynamics are discussed involving turbulence, boundary layers, separation, shock waves, and stresses. Mathematical models and analysis are presented along with computer techniques and a number of applications. GRA

N80-16319# National Technical Information Service, Springfield, Va.
HOT WIRE ANEMOMETRY, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1971 - Aug. 1979
Guy E. Habercom, Jr. Sep. 1979 229 p Supersedes NTIS/PS-78/0882; NTIS/PS-77/0782; NTIS/PS-76/0732; NTIS/PS-75/663
(NTIS/PS-79/0957/5; NTIS/PS-78/0882; NTIS/PS-77/0782; NTIS/PS-76/0732; NTIS/PS-75/663) Avail: NTIS HC $28.00/MF $28.00 CSCL 14B

Abstracts covering the area of hot wire anemometry are presented. Citations include: principles; calibrating; circuit diagrams; flow measurement; hypersonic, supersonic, transonic, and subsonic characteristics; boundary layer studies; turbulence; jet, pipe, and tunnel flow; mathematical models; wind tunnel model tests, airport structure simulation; mass transfer and flow stability; probe modifications; flow about geometric forms; flow patterns; and related topics. GRA

36 LASERS AND MASERS

Includes parametric amplifiers.

N80-16320 Stanford Univ., Calif.
CW LASER ANNEALING OF ION IMPLANTED SINGLE CRYSTAL SILICON Ph.D. Thesis
Arnon Gat 1979 130 p
Avail: Univ. Microfilms Order No. 8001921

Experiments were performed on ion implanted arsenic and boron into single crystal silicon. Even though the two ions are different the same basic, unique properties to the cw laser anneal are found. These are: (1) high level of impurity activation as long as the concentration is below solid solubility, (2) crystalline perfection down to 10A resolution, and (3) lack of dopants redistribution from their as-implanted profile. It was shown that when the implanted layer is too deep, as in the case of high energy arsenic or silicon implants, the recrystallization is not

complete and the resultant structure is polysilicon. The thermal model presented suggests that the cw laser annealing process is performed under thermal equilibrium. Dissert. Abstr.

N80-16321* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
LASER DOPPLER VELOCITY SIMULATOR Patent
John M. Franke, inventor (to NASA) Issued 4 Dec. 1979 7 p Filed 28 Jul. 1978 Supersedes N78-29435 (16 - 20, p 2671)
(NASA-Case-LAR-12176-1; US-Patent-4,176,950; US-Patent-Appl-SN-929083; US-Patent-Class-356-28; US-Patent-Class-332-751; US-Patent-Class-350-359; US-Patent-Class-356-243) Avail: US Patent and Trademark Office CSCL 20E

A method and apparatus for inducing a Doppler frequency shift in a reference beam laser velocimeter light beam to simulate target velocity are described. The light beam is passed through a rotating refractive transparent block positioned between two reference points along the beam which results in a continuous change in the light beam optical path length between the reference points according to a known function. The velocity indicated by the laser velocimeter is compared to the known simulated velocity function for velocimeter testing and calibration.
Official Gazette of the U.S. Patent and Trademark Office

N80-16322*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
CONCEPTUAL DEVELOPMENT OF THE LASER BEAM MANIFOLD (LBM)
Warren Campbell and Robert B. Owen Oct. 1979 16 p
(NASA-TM-78248) Avail: NTIS HC A02/MF A01 CSCL 20E

The laser beam manifold, a device for transforming a single, narrow, collimated beam of light into several beams of desired intensity ratios is described. The device consists of a single optical substrate with a metallic coating on both optical surfaces. By changing the entry point, the number of outgoing beams can be varied. M.G.

N80-16323# ARO, Inc., Arnold Air Force Station, Tenn.
NONORTHOGONAL MEASUREMENT AXES IN LASER DOPPLER VELOCIMETRY Final Report, Oct. 1977 - Sep. 1978
F. L. Crosswy Arnold AFS AEDC Aug. 1979 28 p refs
(AD-A073700; AEDC-TR-79-35) Avail: NTIS HC A03/MF A01 CSCL 20/5

The measurement axes of virtually all multiaxis laser Doppler velocimeter (LDV) systems are nonorthogonal to some degree and are, in general, rotated with respect to orthogonal, Cartesian reference axes. Systematic errors are introduced into the LDV data if axis nonorthogonality and spatial orientation parameters are not properly taken into account by the data reduction equations. This report develops the general 3-space expressions for velocity vector magnitude and spatial orientation in terms of rotated, oblique LDV measurement axis parameters and the velocity vector projections measured by each of these axes.GRA

N80-16324# Los Alamos Scientific Lab., N. Mex.
USE OF LASERS FOR ACCELERATOR DIAGNOSTICS. 1: ELEMENTARY CONCEPTS
J. P. Aldridge and T. D. Hayward 1979 28 p refs Presented at 8th Symp. on Engr. Problems of Fusion Res., San Francisco, Calif., 13 Nov. 1979
(Contract W-7405-eng-36)
(LA-UR-79-2329; CONF-791102-1) Avail: NTIS HC A03/MF A01

The use of high current linear accelerators for H(-) ions in diagnostic instrumentation that will permit accurate determination of the occupied phase space is examined. A laser photo detachment method is proposed to provide this capability. The fundamental processes that are operative are explored and limitations to the accuracy of measurements using this diagnostic are considered. The arrangement required to reconstruct the detailed beam profile from the measurements at several angles is analyzed. DOE

N80-16325# California Univ., Livermore. Lawrence Livermore Lab.
STATISTICAL ANALYSIS OF ABSORPTIVE LASER DAMAGE IN DIELECTRIC THIN FILMS
A. B. Budgor and Karen F. Luria-Budgor 11 Sep. 1978 31 p Presented at Symp. on Optical Mater. for High Power Lasers, Boulder, 11 Sep. 1978 Submitted for publication
(Contract W-7405-eng-48)
(UCRL-81670; CONF-780977-1) Avail: NTIS HC A03/MF A01

The Weibull distribution arises as an example of the theory of extreme events. It is commonly used to fit statistical data arising in the failure analysis of electrical components and in DC breakdown of materials. This distribution is employed to analyze time-to-damage and intensity-to-damage statistics obtained when irradiating thin film coated samples of SiO2, ZrO2, and Al2O3 with tightly focused laser beams. The data used is furnished by Milam. The fit to the data is excellent; and least squared correlation coefficients greater than 0.9 are often obtained. DOE

N80-16326# Los Alamos Scientific Lab., N. Mex.
HIGH-ENERGY, SHORT-PULSE, CARBON-DIOXIDE LASERS
Charles A. Fenstermacher 1979 26 p refs Presented at the Ultra Short Laser Pulses Meeting, London, 23 May 1979
(Contract W-7405-eng-36)
(LA-UR-79-1203; CONF-790558-1) Avail: NTIS HC A03/MF A01

The technological development of carbon dioxide lasers systems is discussed in terms of fusion requirements. Pumping mechanisms, optical gain, and energy storage are considered. Short pulse generation and amplification are described with emphasis on system efficiency. R.C.T.

N80-16327# General Atomic Co., San Diego, Calif.
STEP-BY-STEP APPROACH TO CONVECTIVE COOLING OF LASER DISC AMPLIFIERS
Robert F. Bourque Apr. 1979 37 p refs
(Contract W-7405-eng-48; GA Proj. 3072)
(UCRL-15047) Avail: NTIS HC A03/MF A01

A step by step approach is presented to the problem of gas cooling of laser glass amplifiers. The basic equations are given for glass conduction, thermal stress, gas convection, and heat exchanger and blower design. An example calculation is then carried out for helium gas at one atmosphere with the gas flow in the direction orthogonal to the optical path. It is found that pumping powers and temperatures are acceptable for this case. Results are also presented for helium in the slant direction and for nitrogen in both directions. The effects on pumping power of gas temperature rise, gas pressure, flashtube rep rate, and flow channel width are also included. It is found that, based on temperature rise and pumping power, nitrogen is as viable a coolant as helium. DOE

N80-16328# Los Alamos Scientific Lab., N. Mex.
ANTARES LASER POWER AMPLIFIER
R. D. Stine, G. F. Ross, and C. J. Silvernail 1979 8 p refs Presented at the Pulsed Power Conf., Lubbock, Tex., 12-14 Jun. 1979
(Contract W-7405-eng-36)
(LA-UR-79-1525; CONF-790622-15) Avail: NTIS HC A02/MF A01

The design of the Antares laser power amplifier is discussed. The power amplifier is the last stage of amplification in the 100 kJ Antares laser. A single, cylindrical, grid control, cold cathode electron gun, surrounded by 12 large aperture CO2 electron beam sustained laser discharge sectors is described. A large scale interaction between optical, mechanical, and electrical disciplines required to meet the design objectives is discussed. Significant component advances required by the power amplifier design are reported. DOE

N80-16329# Sandia Labs., Albuquerque, N. Mex.
EVALUATION OF THE EFFECT OF PREPULSES ON HF LASER-TARGET INTERACTIONS
M. Keith Matzen Jun. 1979 25 p refs
(Contract EY-76-C-04-0789)
(SAND-79-0353) Avail: NTIS HC A02/MF A01

The effect of multinanosecond, low-power-density prepulses on the interaction of multinanosecond, 10 to the 14th power

W/sq cm, HF lasers pulses with slab targets were assessed. The emphasis is on analyzing absorption and X-ray conversion efficiency. A survey of previous experiments gives no evidence that these prepulses will affect the total absorption. However, prepulses have been observed to cause qualitative changes in both the X-ray spectrum and conversion efficiency. Numerical simulations indicate that the laser target interaction is effectively insensitive to low-power-density prepulses. These studies imply that basic laser target experiments with multiplexed, HF laser pulses will provide an important characterization of the interaction of long pulse, multiline, approximately 3 microns radiation with targets. Future wavelength comparison experiments will require prepulse suppression or target isolation. DOE

N80-16330# California Univ., Livermore. Lawrence Livermore Lab.
ANALYSIS OF THE Z DEPENDENCE OF LASER GENERATED SUPRATHERMAL ELECTRON TEMPERATURE
M. D. Rosen and K. G. Estabrook 17 Apr. 1979 20 p refs Presented at the 9th Ann. Conf. on Anomalous Absorption of Electromagnetic Waves, Rochester, N.Y., 15-18 May 1979 Submitted for publication
(Contract W-7405-eng-48)
(UCRL-82280; CONF-790564-1) Avail: NTIS HC A02/MF A01

The systematic rise of temperature with Z is theoretically analyzed. It is believed that material albedoes (electron reflectivity) which increase with Z can account for this behavior, since electrons can make multiple passes through the region of resonant electric fields and are thus reheated. A quantitative treatment of this effect yields reasonable agreement with experiment. The effects of magnetic fields and filamentation are also examined. DOE

N80-16331# California Univ., Livermore. Lawrence Livermore Lab.
MASS SPECTROMETER DETERMINATION OF ARGON CONTENTS IN LASER FUSION TARGET PELLETS
C. M. Ward and L. E. Bergquist 16 Apr. 1979 14 p refs Presented at the 1st Topical Meeting on Fusion Reactor Mater., Miami Beach, Fla., 29-31 Jan. 1979 Prepared in cooperation with Martin Marietta Corp., Denver, Colo.
(Contract W-7405-eng-48)
(UCRL-81416-Rev-1; CONF-790125-78) Avail: NTIS HC A02/MF A01

A system for measuring argon contents in individual laser fusion targets using a getter pumped closed volume quadrupole mass spectrometer is developed. Accuracy of 10 percent can be obtained, limited by the calibration standard and electron multiplier drift. Measurements are simple, unambiguous and can be performed at up to one per hour with a sensitivity equivalent to 1,000 Pa (.01 atm) argon in a 140 micrometers internal diameter sphere. DOE

N80-16332# Los Alamos Scientific Lab., N. Mex.
ANTARES POWER AMPLIFIER OPTICAL SYSTEM
C. J. Silvernail and K. C. Jones 1979 8 p refs Presented at Conf. on Optics, Los Alamos, N. Mex., 23 May 1979
(Contract W-7405-eng-36)
(LA-UR-79-2270; CONF-790529-11) Avail: NTIS HC A02/MF A01

The optical systems of the six Antares laser power amplifiers are described. These assemblies are preceded by the front end optics and followed by the target system. Each power amplifier receives an annular input beam and divides it into 12 beams which are then directed to double pass them through 12 gain regions surrounding a central electron gun. Provisions are made for spatially filtering each beam and for the possibility of adding saturable absorbers. Two keys to the successful completion of the power amplifier are: the avoidance of unwanted lasing modes and hot spots in the wavefronts, and the maintenance of alignment throughout the entire laser system, including the internal alignment of the Power Amplifier. DOE

N80-16333# National Technical Information Service, Springfield, Va.
CARBON DIOXIDE LASERS, VOLUME 4. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1978 - Aug. 1979
Diane M. Cavagnaro Oct. 1979 151 p Supersedes NTIS/PS-78/0896; NTIS/PS-77/0710; NTIS/PS-76/0589; NTIS/PS-75/474
(NTIS/PS-79/1068/0; NTIS/PS-78/0896; NTIS/PS-77/0710; NTIS/PS-76/0589; NTIS/PS-75/474) Avail: NTIS HC $28.00/MF $28.00 CSCL 20E

Citations on theory, design, operation, output and diagnostics of CO2 lasers are presented. Studies relating to excitation, frequency conversion, modulation, laser pumping, reaction kinetics, gas dynamics, and plasmas are included. The development and efficiency of optical components such as mirrors, resonators, tuning devices, infrared optical materials, amplifiers, and gratings are also discussed. GRA

N80-16334# National Technical Information Service, Springfield, Va.
CARBON DIOXIDE LASERS, VOLUME 3: A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1976-77
Diane M. Cavagnaro Oct. 1979 178 p
(NTIS/PS-79/1067/2) Avail: NTIS HC $28.00/MF $28.00 CSCL 20E

This bibliography cites reports on the theory, design, operation, output and diagnostics of carbon dioxide lasers. The studies relate to excitation, frequency conversion, modulation, laser pumping, reaction kinetics, gas dynamics, and plasmas. The development and efficiency of optical components such as mirrors, resonators, tuning devices, infrared optical materials, amplifiers, and gratings are also covered. This updated bibliography contains 171 abstracts, none of which is new to the previous edition. GRA

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N80-16335 Engineering Sciences Data Unit, London (England).
DESIGN OF DISC CAMS WITH TRANSLATING ROLLER FOLLOWERS: CALCULATION METHODS
1979 33 p
(ESDU-79007; ISBN-0-85679-252-7; ISSN-0141-4046) For information on availability of series, sub-series, or individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $770.50

A systematic approach to the calculation of kinematic data for external disc cams with translating roller followers is provided. The calculations may be applied to machine tool and automobile engineering, mining equipment, printing, packaging, textile, and special purpose machinery. The results are applicable to all external disc cams with translating roller followers. ESDU (GRA)

N80-16336 Virginia Univ., Charlottesville.
ACTIVE OPTIMAL CONTROL FOR SUPPRESSION OF WHIRL OF A FLEXIBLE CENTRIFUGE Ph.D. Thesis
Marvin Taylor 1979 187 p
Avail: Univ. Microfilms Order No. 8002501

A nonlinear dynamic model of a flexibly supported centrifuge rotor is formulated and studied parametrically for whirl, equilibrium and stability. Experimental data from a test rotor are compared to analytic results for a passive suspension system. The system equations are linearized for application of active linear regulator control and the use of Kalman sequential estimation to suppress whirl. The primary analysis considers a balanced rotor containing a loose small ball. Three additional cases are also studied: (1) unbalance in the rotor containing the small ball; (2) inclusion of the rotor shaft modes due to distributed mass and stiffness of the shaft; and (3) test rotor containing liquid rather than a ball. Computer simulations are performed demonstrating practical, effective feedback control for all of the above cases. Dissert. Abstr.

N80-16337*# Northwestern Univ., Evanston, Ill.
THERMAL ELASTOHYDRODYNAMIC LUBRICATION OF SPUR GEARS Final Report
K. L. Wang and H. S. Cheng Washington Feb. 1980 137 p refs

(Grant NGR-14-007-084)
(NASA-CR-3241) Avail: NTIS HC A07/MF A01 CSCL 13I

An analysis and computer program called TELSGE were developed to predict the variations of dynamic load, surface temperature, and lubricant film thickness along the contacting path during the engagement of a pair of involute spur gears. The analysis of dynamic load includes the effect of gear inertia, the effect of load sharing of adjacent teeth, and the effect of variable tooth stiffness which are obtained by a finite-element method. Results obtained from TELSGE for the dynamic load distributions along the contacting path for various speeds of a pair of test gears show patterns similar to that observed experimentally. Effects of damping ratio, contact ratio, tip relief, and tooth error on the dynamic load were examined. In addition, two dimensionless charts are included for predicting the maximum equilibrium surface temperature, which can be used to estimate directly the lubricant film thickness based on well established EHD analysis. Author

N80-16338*# General Electric Co., Cincinnati, Ohio. Materials and Process Technology Labs.
PROGRAM TO DEVELOP SPRAYED, PLASTICALLY DEFORMABLE COMPRESSOR SHROUD SEAL MATERIALS Interim Technical Progress Report, 29 Jun. 1978 - 28 Feb. 1979
R. C. Schwab Nov. 1979 78 p refs
(Contract NAS3-20054)
(NASA-CR-159741; ITPR-1) Avail: NTIS HC A05/MF A01 CSCL 11A

A study of fundamental rub behavior for ten dense sprayed materials and eight current compressor clearance materials has been conducted. A literature survey of a wide variety of metallurgical and thermophysical properties was conducted and correlated to rub behavior. Based on these results, the most promising dense rub material was Cu-9Al. Additional studies on the effects of porosity, incursion rate, blade solidity and ambient temperature were carried out on aluminum bronze (Cu-9Al-1Fe) with and without a 5158 Feltmetal underlayer. Author

N80-16339*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CONTINUOUS SELF-LOCKING SPIRAL WOUND SEAL Patent Application
Stephen C. Irick, inventor (to NASA) Filed 20 Nov. 1979 13 p
(NASA-Case-LAR-12315-1; US-Patent-Appl-SN-096257) Avail: NTIS HC A02/MF A01 CSCL 11A

A spiral wound seal for effecting a seal between two surfaces is described. The seal consists of a strip of gasket material wound into a groove machined into one of the surfaces. The gasket strip is wider than the groove is deep such that a portion of the gasket material protrudes from the groove. The seal is effected by clamping the second surface onto the first surface and thereby compressing the protruding gasket material. NASA

N80-16340*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRIBOLOGICAL PROPERTIES OF SILICON CARBIDE IN METAL REMOVAL PROCESS
Kazuhisa Miyoshi and Donald H. Buckley 1980 18 p refs
To be presented at Intern. Symp. on Metal Working Lubrication, San Francisco, 18-19 Aug. 1980; sponsored by ASME
(NASA-TM-79238) Avail: NTIS HC A02/MF A01 CSCL 13H

Material properties are considered as they relate to adhesion, friction, and wear of single crystal silicon carbide in contact with metals and alloys that are likely to be involved in a metal removal process such as grinding. Metal removal from adhesion between sliding surfaces in contact and metal removal as a result of the silicon carbide sliding against a metal, indenting into it, and plowing a series of grooves or furrows are discussed. Fracture and deformation characteristics of the silicon carbide surface are also covered. The adhesion, friction, and metal transfer to silicon carbide is related to the relative chemical activity of the metals. The more active the metal, the higher the adhesion and friction, and the greater the metal transfer to silicon carbipe. Atomic size and content of alloying elements play a dominant role in controlling adhesion, friction, and abrasive wear properties of alloys. The friction and abrasive wear (metal removal) decrease linearly as the shear strength of the bulk metal increases. They decrease as the solute to solvent atomic radius ratio increases or decreases linearly from unity, and with an increase of solute content. The surface fracture of silicon carbide is due to cleavages of 0001, 10(-1)0, and/or 11(-2)0 planes. J.M.S.

N80-16341*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF WEAR-DEBRIS FROM FULL-SCALE BEARING FATIGUE TESTS USING THE FERROGRAPH
William R. Jones and Stuart H. Loewenthal 1980 22 p refs
Prepared for presentation at the Ann. Meeting of the Am. Soc. of Lubrication Engr., Anaheim, Calif., 5-8 May 1980
(NASA-TM-81403; E-9827) Avail: NTIS HC A02/MF A01 CSCL 13H

The ferrograph was used to determine the types and quantities of wear particles generated during full-scale bearing fatigue tests. Deep-groove ball bearings made from AISI 52100 steel were used. A MIL-L-23699 tetraester lubricant was used in a recirculating lubrication system containing a 49 mm absolute filter. Test conditions included a maximum Hertz stress of 2.4 GPa, a shaft speed of 15,000 rpm, and a lubricant supply temperature of 74 C (165 F). Four fatigue failures were detected by accelerometers in this test set. In general, the ferrograph was more sensitive (up to 23 hr) in detecting spall initiation than either accelerometers or the normal spectrographic oil analysis. Four particle types were observed: normal rubbing wear particles, spheres, nonferrous particles, and severe wear (spall) fragments. Author

N80-16342*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
***PERFORMANCE OF COMPUTER-OPTIMIZED* TAPERED-ROLLER BEARINGS TO 2.4 MILLION DN**
R. J. Parker, S. I. Pinel (Industrial Tectonics, Inc., Compton, Calif.), and H. R. Signer (Industrial Tectonics, Inc., Compton, Calif.) 1980 29 p refs Proposed for presentation at the Intern. Lubrication Conf., San Francisco, 18-21 Aug. 1980; sponsored by ASME and the Am. Soc. of Lubrication Engr.
(NASA-TM-81414; E-332) Avail: NTIS HC A03/MF A01 CSCL 13I

The performance of 120.65 mm bore high speed design tapered roller bearings was investigated at shaft speeds to 20,000 rpm under combined thrust and radial load. The test bearing design was computer optimized for high speed operation. Temperature distribution and bearing heat generation were determined as a function of shaft speed, radial and thrust loads, lubricant flow rates, and lubricant inlet temperature. The roller bearing operated successfully at shaft speeds up to 20,000 rpm under heavy thrust and radial loads. Cup cooling was effective in decreasing the high cup temperatures to levels equal to the cone temperature. K.L.

N80-16343# Rockwell International Corp., Thousand Oaks, Calif. Science Center.
FUNDAMENTALS OF PLASMA ARC WELDING Final Report, 1 Apr. 1975 - 30 Sep. 1978
C. B. Shaw, Jr. Aug. 1979 102 p refs
(Contract N00014-75-C-0789)
(AD-A074340; SC5031.8-F) Avail: NTIS HC A06/MF A01 CSCL 13/8

A three-year study was made of physical phenomena underlying operation of the plasma-arc welding (PAW) process. Experimental methods were developed to measure plasma spectral intensities during welding, a mathematical method was perfected to compute plasma temperature distributions from the spectral data, and statistical methods were used to extract maximum information from the data and to infer improved values for four ARII transition probabilities. Welds in mild and stainless steels and in Ti-6Al-4V up to 12.7 mm thick were evaluated by metallography and/or by cyclic fatigue studies. At low stress concentration levels, PAW was found to reduce cyclic crack growth rates in the weld metal compared to the parent metal. There appears to be evidence that plasma spectroscopy can aid in selection and control of welding parameters. The plasma temperature measurements clarify the mechanism whereby use of auxiliary ports in the PAW torch orifice cup reduces the width

of a weld nugget. Simple plasmadynamic models were used to relate orifice geometry to plasma temperature and electrical resistance, and to weld quality, thus accounting for the observation that a convergent orifice enhances weld penetration, reduces weld width, and improves weld nugget geometry without causing double-arcing, while a divergent orifice (which simulates an eroded orgice cup) has the opposite, deleterious effects. Nine documents are cited in which these results were reported and complete preprints of four journal articles not yet published are included as appendices. GRA

N80-16344# Shaker Research Corp., Ballston Lake, N. Y.
ROTOR-BEARING DYNAMICS TECHNOLOGY DESIGN GUIDE. PART 3: TAPERED ROLLER BEARINGS Interim Report, Apr. 1977 - Nov. 1978
A. B. Jones and J. M. McGrew, Jr. Wright-Patterson AFB, Ohio AFAPL Feb. 1979 92 p refs
(Contract F33615-76-C-2038; AF Proj. 3048)
(AD-A074827; SRC-78-TR-33-Pt-3; AFAPL-TR-78-6-Pt-3) Avail: NTIS HC A05/MF A01 CSCL 13/9

This report is an update of the original Part 4 of the Rotor-Bearing Dynamics Design Technology Series, AFAPL-TR-65-45 (Parts 1 through 10). A computer program is given for preparation of tapered roller bearing stiffness data input for rotordynamic response programs. The complete stiffness matrix is calculated including centrifugal effects. Consideratives such as elastohydrodynamic and cage effects are not included since they have little influence on the calculation of tapered roller bearing stiffness. The resulting program is reasonably small and easy to use. GRA

N80-16345# SKF Industries, Inc., King of Prussia, Pa.
M-50 STEEL BEARING MATERIAL FACTORS FOR ROLLING ELEMENT LIFE CALCULATIONS Final Report, 18 Dec. 1977 - 1 Apr. 1979
Frank R. Morrison, John I. McCool, and Nicholas J. Ninos 1 Apr. 1979 113 p refs
(Contract DAAK50-77-C-0009)
(AD-A074217; SKFAL79T013; USAAVRADCOM-TR-79-35) Avail: NTIS HC A06/MF A01 CSCL 13/9

This report presents the results of a survey accumulating life results achieved from bearings manufactured from M-50 tool steel. Life data have been analyzed according to an existing computer program, TABACY. Material and lubrication factors have been determined using this data base, enabling a more accurate calculation of the potential life of a bearing. In addition, this report includes experimental endurance life data obtained on three groups of rolling element bearings manufactured of Vacuum Induction Melted Vacuum Arc Remelted (VIMVAR) M-50 steel. The three bearing designs, all of which have a 45 mm internal diameter, consist of a deep groove ball, an angular contact ball, and a cylindrical roller configuration. These types have been run under several operational conditions using circulating Mobil Jet II synthetic lubricating fluid MIL-L-23699. GRA

N80-16346# Princeton Univ., N. J.
COMBUSTION OPTIMIZATION STUDIES FOR STRATIFIED CHARGE AND DIESEL ENGINES Progress Report, 1 Oct. 1978 - 30 Sep. 1979
R. L. Steinberger and F. V. Bracco Aug. 1979 9 p
(Contract EC-77-S-02-4191)
(COO-4191-2) Avail: NTIS HC A02/MF A01

The transparent-piston, transparent-head engine is in routine use for visualization experiments. The gaseous fuel injector is routinely used with gaseous propane as a fuel injected into the motored engine. High speed filming and short duration pulsed light single exposure techniques are being used to obtain shadow and schlieren records of gaseous and liquid jets. An LDV system for measuring in-cylinder velocities was implemented and data are presently being taken and analyzed. Engine cylinder pressure data can now be taken and reduced with the minicomputer; and an infrared emission absorption technique is used to measure engine cylinder temperature. An alternative approach to the modeling of gaseous jets yielded a characteristic time for steadying of the jet, which in the long run should allow a more efficient computational procedure. Work on the definition of appropriate equations for thick sprays continues. Visual data on engine cyclic variations were obtained with the pulsed illumination television system. DOE

N80-16347# Sandia Labs., Livermore, Calif. Combustion Applications Div.
ENGINE COMBUSTION TECHNOLOGY OVERVIEW
C. W. Robinson and S. C. Keeton Oct. 1978 6 p Presented at the Highway Vehicle Systems Contractors Meeting, Dearborn, Mich., 17 Oct. 1978
(Contract EY-76-C-04-0789)
(SAND-78-8801; CONF-781050-1) Avail: NTIS HC A02/MF A01

A five-year program to develop technology for increasing the efficiency of automotive, truck, and stationary engines and for switching to modified or alternate fuels is discussed. The plan calls for a coordinated program involving DOE/Fossil Fuel Utilization, universities, DOE laboratories, private research organizations, and the engine manufacturing industry. The program plan is complementary to existing programs in the DOE/TEC, DOD, and DOT, and is coordinated with those efforts. DOE

N80-16348# Babcock and Wilcox Co., Alliance, Ohio. Research and Development Div.
DEVELOPMENT OF AUTOMATED WELDING PROCESSES FOR FIELD FABRICATION OF THICK-WALLED PRESSURE VESSEL: ELECTRON BEAM METHOD Quarterly Report 1 Apr. - 30 Jun. 1978
Charles M. Weber 1978 37 p
(Contract EF-77-C-01-2606)
(DOE/ET-2606/3; QR-3) Avail: NTIS HC A03/MF A01

An electron beam welding procedure was developed for welding 8 in. thick SA 387 Grade 22 Class 2 (2 1/4 Cr-1 Mo) steel. A total of 95 welds were made in the horizontal position. DOE

N80-16349# General Electric Co., Sunnyvale, Calif. Advanced Reactor Systems Dept.
METHOD OF ASSESSING THE IMPACT OF METALLURGICAL NOISE AND ITS REDUCTION IN ULTRASONIC TESTING OF AUSTENITIC WELDS
R. A. Day Aug. 1979 24 p refs Presented at the 1979 IEEE Ultrasonics Symp., New Orleans, Sep. 1979
(Contract EY-76-C-03-0893)
(GEFR-SP-164; CONF-790868-1) Avail: NTIS HC A02/MF A01

A method of reducing the ultrasonic noise, or spurious echos, often present in austenitic metals was developed. The method was used on specimens of Type 316 stainless steel, Alloy B00, 16-8-2 weld metal, and Inco-82 type weld metal, and was applied to shear wave tests. It is applicable to longitudinal wave tests. Noise in these materials was subsequently reduced relative to saw cut notches in welded samples. Signal-to-noise improvements of 8Db have been achieved in 16-8-2 weld metal, and order of magnitude improvements is obtained in the probability of large noise signals per inspection. Experiments with 1 and 1/2 megahertz inspection indicate that the improvement attributed to longitudinal wave inspection may be due to the difference in wavelength rather than wave mode. DOE

N80-16350# Science Applications, Inc., Los Angeles, Calif.
LONG LIFE HYDRAULIC BRAKE SYSTEM, SUMMARY Final Report, Oct. 1977 - Mar. 1979
R. Ziskind, I. Osofsky, Y. Mansoor, F. Oldham, and D. Couts May 1979 37 p refs
(Contract DOT-HS-7-01776)
(PB80-104730; SAI-068/80/516; DOT-HS-805-068) Avail: NTIS HC A03/MF A01 CSCL 13F

A long life brake system for passenger vehicles which would have a doubled period between required servicing in comparison to conventional systems was designed. Service life was found initially to be defined by friction pair maintenance in the 30,000 - 40,000 mile range. Subsequent servicing requirements were necessitated by a number of mechanisms derived in large part by fluid degradation, metal corrosion, and rubber deterioration. A long life design approach was specified satisfying a doubled friction pair lifetime and a 100,000 mile balance of system service-free life. Component-by-component design

approach alternatives were given and three test procedures described with which to evaluate compliance with the postulated standard. GRA

N80-16351# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
ASSEMBLY OF INTERFERENCE FITS BY IMPACT AND CONSTANT FORCE METHODS M.S. Thesis
Craig C. Selvage Jun. 1979 54 p refs
(Grant NSF APR-74-18173)
(PB-301289/5; T-683; NSF/RA-790135) Avail: NTIS HC A04/MF A01 CSCL 13H

It is shown that the Poisson effect becomes an important consideration in the assembly of interference fits when the product of Poisson's ratio, coefficient of friction, and the contact length to interference diameter ratio exceeds 0.1. The residual axial stresses resulting from assembly forces are analyzed in detail, and the minimum energy which must be supplied to begin insertion is calculated. An approximate energy analysis of the insertion of an interference fit by an impact load is presented. This analysis takes into account the presence of an axial preload force which might be applied as the impact takes place. Two experiments show a good correlation between the theory and data for impact by hammer blows. GRA

N80-16352# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
INFORMATION APPROACH TO PARTS MATING
Sergio N. Simunovic Apr. 1979 197 p refs
(Grant NSF APR-74-18173)
(PB-300619/6; NSF/RA-790134; T-690) Avail: NTIS HC A09/MF A01 CSCL 13H

The interaction of mechanical parts during the assembly process, the nature of the information available during this interaction, and the form and use of this information in aiding parts mating is examined. The development programmable industry assembly is discussed and how to determine the performance characteristics necessary for a positioning device designed for assembly is addressed. Topics discussed include: the assembly process as a positioning problem and the study of parts mating as a means of solving for this positioning problem; the transition from transporting the parts to positioning the parts for starting the assembly; the actual parts assembly or mating; and the implications of the parts mating study on the configuration of an assembly system. A description of the kinematics of rigid solids in space, a two dimensional analysis of a peg in hole insertion, theoretical performance evaluations, geometric information, experimental design, and position estimation implementation are presented. GRA

N80-16353# National Technical Information Service, Springfield, Va.
INERT GAS WELDING. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1964 - Aug. 1979
William E. Reed Oct. 1979 237 p Supersedes NTIS/PS-78/0903, NTIS/PS-77/0766, NTIS/PS-76/0724 and NTIS/PS-75/764
(NTIS/PS-79/0995/5; NTIS/PS-78/0903; NTIS/PS-77/0766; NTIS/PS-76/0724; NTIS/PS-75/764) Avail: NTIS HC $28.00/MF $28.00 CSCL 13H

Research reports on the development of techniques and procedures for inert gas welding and with the characteristics of the resulting welds are presented. Process control, automation, nondestructive testing, and health hazards are also investigated. Metals welded include steel, titanium, aluminum, uranium, and refractory metals. This updated bibliography contains 229 abstracts, 26 of which are new entries to the previous edition. GRA

N80-16354# National Technical Information Service, Springfield, Va.
INERT GAS WELDING, VOLUME 3: CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1977 - Aug. 1979
William E. Reed Oct. 1979 125 p Supersedes NTIS/PS-78/-905, NTIS/PS-77/0767 and NTIS/PS-76/0726
(NTIS/PS-79/0996/3; NTIS/PS-78/0905; NTIS/PS-77/0767; NTIS/PS-76/0726) Avail: NTIS HC $28.00/MF $28.00 CSCL 13H

Reports from worldwide research are cited which deal with the development of techniques and procedures for inert gas welding and with the characteristics of the resulting welds. Process control, automation, and applications are also investigated. Metals welded include steel, titanium, aluminum, copper, and cast iron. This updated bibliography contains 119 abstracts, 27 of which are new entries to the previous edition. GRA

N80-16207*# Army Missile Research and Development Command, Redstone Arsenal, Ala.
AN EXPERIMENTAL DESIGN FOR TOTAL CONTAINER IMPACT RESPONSE MODELING AT EXTREME TEMPERATURES
Virginia P. Kobler, Richard M. Wyskida, and James D. Johannes *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 101-107 refs Prepared in cooperation with Alabama Univ. in Huntsville (For primary document see N80-16198 07-31)
Avail: NTIS HC A09/MF A01 CSCL 20K

N80-16209*# Southwest Research Inst., San Antonio, Tex.
TEST EVALUATION OF SHOCK BUFFERING CONCEPT FOR HYDRODYNAMIC RAM INDUCED BY YAWING PROJECTILE IMPACTING A SIMULATED INTEGRAL FUEL TANK
Patrick H. Zabel *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 141-170 refs (For primary document see N80-16198 07-31)
Avail: NTIS HC A09/MF A01 CSCL 20D

N80-16210*# Southwest Research Inst., San Antonio, Tex.
PREDICTION OF FRAGMENT VELOCITIES AND TRAJECTORIES
J. J. Kulesz, L. M. Vargas, and P. K. Moseley *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 171-187 refs (For primary document see N80-16198 07-31)
(Contract NAS3-20497)
Avail: NTIS HC A09/MF A01 CSCL 20K

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N80-16355# Air Force Materials Lab., Wright-Patterson AFB, Ohio. Metal Behavior Branch.
THE DEVELOPMENT OF QUANTITATIVE NDI FOR RETIREMENT-FOR-CAUSE Final Report, Sep. 1975 - Jun. 1976
J. M. Hyzak, W. H. Reiman, and J. E. Allison Feb. 1979 33 p refs
(AF Proj. 2307)
(AD-A068403; AFML-TR-78-198) Avail: NTIS HC A03/MF A01 CSCL 14/4

To investigate the viability of quantifying NDI signals, relationships between eddy current signals and flaw dimensions were examined. The prime emphasis of this report is exploring these relationships and the difficulties encountered in establishing them. A fracture mechanics/NDI-based disk rejection criteria, retirement-for-cause, which required quantitative NDI, is also described. The case of radially cracked bolt holes in a turbine disk inspected by a semiautomatic eddy current technique is used to illustrate the procedures. Monotonically increasing relationships, primarily logrithmic in nature, were observed between signal characteristics and the dimensions of EDM notches which were used to model actual cracks. Sensitivity level and eddy current system choice were observed to significantly affect the eddy current/flaw dimension relationships. Author

N80-16356*# M&S Computing, Inc., Huntsville, Ala.
DIGITAL ULTRASONIC SIGNAL PROCESSING: PRIMARY ULTRASONICS TASK AND TRANSDUCER CHARACTERIZATION USE AND DETAILED DESCRIPTION Final Report
P. L. Hammond 1 Nov. 1979 560 p
(Contract NAS8-33100)

(NASA-CR-161370; Rept-79-070) Avail: NTIS HC A24/MF A01 CSCL 14D

This manual describes the use of the primary ultrasonics task (PUT) and the transducer characterization system (XC) for the collection, processing, and recording of data received from a pulse-echo ultrasonic system. Both PUT and XC include five primary functions common to many real-time data acquisition systems. Some of these functions are implemented using the same code in both systems. The solicitation and acceptance of operator control input is emphasized. Those operations not under user control are explained. A.R.H.

N80-16357# Akron Univ., Ohio. Dept. of Mathematical Sciences.

A GENERAL APPROACH TO ORDERING OF PARAMETERS WITH APPLICATION IN RELIABILITY Final Report

John C. Conlon Aug. 1979 8 p

(Grant AF-AFOSR-3670-78; AF Proj. 2304)

(AD-A074246; AFOSR-79-0962TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The reports dealt with the applications of the theory of G-ordered functions in reliability; the applications of the theory of G-monotone functions in reliability; ahp some majorization results for a system of flow. The monograph deals with the topics of partial orderings on N-dimensional space and their use in probability and statistics. GRA

N80-16358# Missouri Univ. - Columbia. Dept. of Statistics.

A MAXIMUM LIKELIHOOD ESTIMATOR FOR AN EXPONENTIAL PARAMETER FROM A LIFE TEST WITH BOTH TYPE 1 AND TYPE 2 CENSORING

Kenneth B. Fairbanks Aug. 1979 36 p refs

(Contract N00014-76-C-0789)

(AD-A073895; TR-86) Avail: NTIS HC A03/MF A01 CSCL 12/1

A hybrid life test on items assumed to have an exponential lifetime combines type 1 and type 2 censoring. In type 1 censoring, n items are placed on test and observed for a fixed time t^*, while in type 2 censoring the test terminates with the rth sub 0 failure, where r sub 0 is a preassigned integer. If t sub r sub 0 is the time of the rth sub 0 failure, a hybrid life test terminates at min(t sub r sub 0, t^*). In some situations it may be of interest to estimate the average lifetime theta, following the test decision. In this report, we find the maximum likelihood estimator, theta-cap, when the sample is subject to hybrid censoring. An expression for E(theta-cap) is derived. Because this expression is complex, computer simulations are used to examine the bias of theta-cap. GRA

N80-16359# Missouri Univ. - Columbia. Dept. of Statistics.

CONFIDENCE INTERVALS FOR AN EXPONENTIAL PARAMETER FROM A TWO STAGE LIFE TEST

Kenneth B. Fairbanks Aug. 1979 34 p refs

(Contract N00014-76-C-0789)

(AD-A073896; TR-87) Avail: NTIS HC A03/MF A01 CSCL 12/1

The two stage life test of Bulgren and Hewett (1973) for the mean lifetime, theta, of an exponentially distributed lifetime is essentially a two stage version of type 2 censoring. Since the test decision only determines whether theta is above or below theta sub 0, it may be of interest to estimate theta following the decision using the test data. Epstein (1960a) found confidence intervals for under type 2 censoring. This report shows that Epstein's intervals may be modified slightly and used to provide confidence intervals for theta following the two stage test. The resulting confidence intervals are shown to be conservative.GRA

N80-16360# Missouri Univ. - Columbia. Dept. of Statistics.

APPROXIMATE CONFIDENCE INTERVALS FOR AN EXPONENTIAL PARAMETER FROM A SEQUENTIAL LIFE TEST

Kenneth B. Fairbanks Aug. 1979 37 p refs

(Contract N00014-76-C-0789)

(AD-A073897; TR-88) Avail: NTIS HC A03/MF A01 CSCL 12/1

A sequential life test for the exponential location parameter was given by Epstein and Sobel (1955). This sequential test may be modified by truncating the test at r sub 0 failures and/or at total test time t'. There may be a need or a desire to also estimate the parameter after the test decision, using the test data. Bryant and Schmee (1979) have given confidence intervals for the mean lifetime, theta, from a truncated sequential test scheme, using methods which depend heavily on numerical techniques using a computer. A more flexible approach is considered using a martingale inequality which was also given by Wald (1947) in another context. Interval estimates are found which are functions of a positive constant d which must be chosen less than an upper bound which is itself a function of the number of failures observed. It is suggested that d be chosen as a function of the sample path (i.e., after the test is complete). The validity of the confidence coefficient comes into question if this posterior selection of d is employed. Simulation studies indicate that the resulting intervals are usually conservative.

Author (GRA)

N80-16361# Allied Chemical Corp., Idaho Falls, Idaho.

COMPUTERIZED QUALITY CONTROL TECHNIQUES

G. D. Halverson, A. R. Camarata, R. L. Hand, F. W. Spraktes, and J. M. Baldwin 1979 49 p refs Presented at the 20th Ann. Meeting of the Inst. of Nucl. Mater. Management, Albuquerque, N. Mex., 16 Jul. 1979

(Contract EY-76-C-14-2170)

(CONF-790707-11) Avail: NTIS HC A03/MF A01

An examination of historical semicontrolled data for providing a quality control tool by yielding information for such items as: (1) mathematical correction of unidentified systematic deviations; (2) estimation of confidence in lab results; and (3) detection of correctable trends is presented. A computerized quality control system is described and related topics including: (1) data flow and control; (2) use of statistics and graphics in data examination; (3) aspects of human interaction with a computerized system; and (4) the advantages and possible disadvantages of using the described system are discussed. DOE

N80-16362# Oak Ridge National Lab., Tenn. Computer Sciences Div.

EFFICIENT PROCEDURE FOR SELECTING AMONG FIVE RELIABILITY MODELS Ph.D. Thesis

J. E. A. Kent (Nucl. Regulatory Comm.) Oct. 1979 228 p refs

(Contract W-7405-eng-26)

(ORNL/CSD-43) Avail: NTIS HC A11/MF A01

Several parametric families of probability distributions used to model reliability and life testing data are considered. An efficient technique for selecting the best fitting family of distributions is derived. This technique uses scale-invariant statistics that minimize the probabilities of misclassification, and is extended beyond pairwise selections to selecting from a class of families of competing distributions. These statistics are not used in the hypothesis testing framework, but rather as measures of likelihood that the observed data have a distribution from a particular family of probability distributions. The class of families considered are the Uniform, Exponential, Gamma, Weibull, and Lognormal distributions, for the cases of shape parameters both known and unknown. Results of computer simulations are given for pairwise and multiple family selection procedures, showing the misclassification error rates achieved for selected sample sizes. Illustrations based on actual data are presented, along with a user program for convenient implementation of this procedure. DOE

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N80-16363 Engineering Sciences Data Unit, London (England).

INELASTIC SHEAR STRESSES AND STRAINS IN THE ADHESIVES BONDING LAP JOINTS LOADED IN TENSION OR SHEAR (COMPUTER PROGRAM)

1979 41 p

(ESDU-79016; ISBN-0-85679-261-6) For information on availability of series, sub-series and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161 $770.50

A computer program for the analysis of the distribution of the shear stresses and strains in the adhesives which bond lap joints of multistep configuration loaded in tension or shear is presented. The program allows for the nonlinear shear stress-strain properties of the adhesive and assumes that the adherend material behavior is elastic. Program lists are provided in the two languages of FORTRAN IV and BASIC. ESDU

N80-16364 Michigan State Univ., East Lansing.
SOME APPROXIMATIONS IN VIBRATIONS AND WAVE MOTION OF ELASTIC MEDIA Ph.D. Thesis
Michael Yvon Rondeau 1979 98 p
Avail: Univ. Microfilms Order No. 8001583

A study of wave propagation phenomena in a linear, elastic, isotropic, homogeneous layer is presented. The motion is described by the integral method of Kirchhoff derived through Hamilton's principle, which serves as the starting point for various approximations to be developed. A series expansion procedure coupled with a new truncation concept is used to construct two dimensional partial differential equations for motions in the layer. Frequency spectra associated with traveling waves in a traction free layer are studied and compared with the spectra preductions of Medick, Nikodem and that of the three-dimensional theory. Impact boundary conditions are applied at the top of the plate and free stresses are applied at the bottom of the plate. The Differential-Difference equations are reduced to Difference equation. Dissert. Abstr.

N80-16365 Stanford Univ., Calif.
A DIFFERENTIAL GEOMETRIC APPROACH TO MATERIAL DEFORMATION Ph.D. Thesis
Edward Marinus Olsen 1979 188 p
Avail: Univ. Microfilms Order No. 8001981

An appropriate language to discuss nonlinear material deformation is differential geometry, as the analysis can establish kinematical quantities in a coordinate-free description. The material kinematical description proceeds first with a metric free or affine analysis. The configuration space of material deformation is expressed in terms of the geometric quantities of torsion and curvature. The introduction of a mentric goes beyond the usual definitions in Riemannian geometry and allows Ricci's lemma to be violated. A nonmetric quantity is introduced which describes the failure of length to be invariant to parallel transport. The configuration space is then described as a nonmetric nonRiemannian space. The understanding of local material yielding and fracture using a global analysis is mathematically developed using path independent integrals of the appropriate field quantities. Material deformation is the movement of a point on a hypersurface having variables to describe yielding, fracture and unloading. Dissert. Abstr.

N80-16366 Notre Dame Univ., Ind.
DYNAMIC YIELDING OF POLYCRYSTALLINE MATERIALS UNDER BIAXIAL LOADING Ph.D. Thesis
Daniel Hon-Ying Ng 1979 285 p
Avail: Univ. Microfilms Order No. 8002619

The dynamic responses as well as static initial and subsequent yield surfaces of a number of specimens made of 6061-T6 aluminum alloy are presented. The stress path obtained in a dynamic biaxial test are reproduced statically. Thd corresponding stress-strain curves are compared and found significantly different. It is found that the dynamic initial yielding occurs at a higher state of biaxial stress depending on the loading rate than that of static yielding. The experimental results are used to verify a set of plastic strain rate equations formulated by analyzing dislocation dynamics through a statistical approach. The theoretical axial and hoop plastic strain rates obtained by the rate equations are found to be in reasonable agreement with the experimental results. Dissert. Abstr.

N80-16367 Stanford Univ., Calif.
ACOUSTOELASTIC ANALYSIS OF CENTER-CRACKED PANELS Ph.D. Thesis
John Bradley Croom Hunter 1979 89 p
Avail: Univ. Microfilms Order No. 8001940

Mechanical and electronic systems were developed for accurate measurement of sound speed variation for longitudinal acoustic waves in uniaxial tensile specimens and stressed panels. Pulse superposition techniques were used in measuring acoustic velocity changes with applied load. These measurements were used for characterization of acoustoelastic response for aluminum and steel alloys. For elastic loading, the velocity changes proportionally with the sum of the inplane principal stresses. This is in agreement with theoretical prediction and is a key result that permits acoustoelastic stress measurement. Stress field measurements were made using the acoustic technique and the uniaxial results for calibration. Loaded panel specimens containing cracks, notches and a central hole were examined and the results compared with theoretical elastic solutions. A technique for extracting the stress intensity factors from acoustoelastic stress measurements around a crack in a loaded panel is described. Dissert. Abstr.

N80-16368 Washington Univ., Seattle.
DYNAMIC ANALYSIS OF SHELLS OF REVOLUTION-SOIL SYSTEMS Ph.D. Thesis
Osama Moustafa El-Shafee 1979 228 p
Avail: Univ. Microfilms Order No. 8001220

A finite element model was developed to analyze shells of revolution under dynamic loading with soil-structure interaction effects. The model consists of high-precision rotational shell finite elements, representing the axisymmetric shell, supported on an equivalent boundary system, representing the soil medium. The substructure method is used to model the shell and soil components. In addition to the seismic analysis capability of the proposed model, it is also applicable to other dynamic loads such as wind. The dynamic behaviour of a hyperboloidal cooling tower shell on discrete supports with a ring footing is studied. Dynamic properties are studied and stress analysis is carried out for a variety of soil conditions. Dissert. Abstr.

N80-16369 Case Western Reserve Univ., Cleveland, Ohio.
STEADY STATE RESPONSE OF A CIRCULAR FOUNDATION ON A TRANSVERSELY ISOTOPIC MEDIUM Ph.D. Thesis
David John Kirkner 1979 233 p
Avail: Univ. Microfilms Order No. 8001463

Dimensionless parameters which are functions of the elastic constants are utilized to define the degree of anisotropy when the foundation investigated is undergoing vertical, rocking or translational vibrations. Impedance and compliance coefficients are presented in tables and curves for a wide range of a dimensionless frequency parameter. Approximate impedance and compliance coefficients are also obtained for a viscoelastic soil. For massive foundations undergoing harmonic vibrations, the dimensionless part of the isotropic impedance function may be used with the expression for the anisotropic static stiffness to obtain the amplitude of vibration. A dimensionless parameter determines the Poisson's ratio of the equivalent isotropic soil. The result is important for the design of machine foundations since it allows for an approximate analysis by using the available isotropic solutions. Dissert. Abstr.

N80-16370 Virginia Univ., Charlottesville.
STRESS SINGULARITIES AT THE CORNERS OF A SEMI-INFINITE STRIP Ph.D. Thesis
William Richard Stout 1979 42 p
Avail: Univ. Microfilms Order No. 8002522

The problem delta delta W(x,y) = 0 in the semi-infinite strip $0 < x < 1$ and $0 < y$, subject to the boundary conditions: W(0,y) = W sub x (0,y) = 0 W(1,y) = W sub x (1,y) = 0 W(x,0) = 0 W sub y (x,0) = h(x) is considered. The problem is decomposed into its even and add parts about x = 1/2, and the analysis is carried out for the even part. A relation is derived connecting W(x,y) and the solution u(x,y) of a related harmonic problem delta u(x,y) with boundary conditions derived from those for W(x,y). An integral containing the singular part of u(x,y) is obtained. A harmonic boundary value problem is then derived for the singular part of u. Dissert. Abstr.

N80-16371 Stanford Univ., Calif.
THE USE OF STRESS CHANGE EXPERIMENTS TO STUDY THE MECHANISMS OF ELEVATED TEMPERATURE DEFORMATION Ph.D. Thesis

Jeffrey Clarke Gibeling 1979 377 p
Avail: Univ. Microfilms Order No. 8001923

The interpretation of stress change experiments in terms of dislocation creep mechanisms is studied. The development of techniques for high precision and conventional resolution strain transient measurements is described. These methods are applied to the study of polycrystalline aluminum, copper and lead as well as single crystals of aluminum and lead. Evidence of instantaneous dislocation motion and measurements of the time dependent strains are discussed along with the nature of apparent delay times and creep anelasticity. Conclusions are presented.
Dissert. Abstr.

N80-16372 Engineering Sciences Data Unit, London (England).
ELASTIC STRESS CONCENTRATION FACTORS: RECTANGULAR NOTCH IN THE EDGE OF A WIDE FLAT PLATE IN TENSION
Jul. 1979 2 p
(ESDU-79008; ISBN-0-85679-253-5) For information on availability of series, sub-series, or individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161 HC $50.50

Data is provided on the maximum stress at rectangular notches in the side of plates subjected to tensile loading. Typical applications are plates or bars in machinery or structures. The range of applicability is for rectangular notches having a width to depth ratio in the range 0.4 to 10.0 and a corner radius to depth ratio in the range 0.2 to 1.0.
ESDU

N80-16373# National Aerospace Lab., Tokyo (Japan).
THE FREE VIBRATION EQUATIONS, NATURAL FREQUENCIES AND MODAL CHARACTERISTICS OF CLOSED CIRCULAR CYLINDRICAL SHELLS
Tatsuzo Koga and Keiji Komatsu Apr. 1979 45 p refs
(NAL-TR-569T) Avail: NTIS HC A03/MF A01

The relative accuracies of the representative classical theories of thin shells are examined. The order of magnitude comparison of terms involved in the governing equations for the free vibrations of a circular cylindrical shell is the method utilized. The boundary conditions for the shells are taken into account and it is shown that the classical theories yield valid solutions accurate enough when taking into consideration the errors inherent in the Kirchhoff-Love hypothesis. A first approximation, consistent with the order of magnitude estimate, leads to a system of free vibration and boundary constraining equations. The approximation enabled a qualitative estimate of the forms of the characteristic solutions. The accuracy of the Donnell type approximation is investigated and a detailed account of the historical developments of the subject is provided.
A.W.H.

N80-16374# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
INITIAL IMPERFECTION MEASUREMENTS OF INTEGRALLY STRINGER-STIFFENED CYLINDRICAL SHELLS
J. Singer, H. Abramovich, and R. Yaffe Dec. 1978 124 p refs
(TAE-330) Avail: NTIS HC A06/MF A01

The initial geometric imperfections of integrally stringer stiffened cylindrical shells were measured in a special scanning system, on laboratory scale. The system consists essentially of a probe, travelling along a helical path inside the shell, whose output is recorded digitally on a minicomputer. The imperfection measurements of 19 shells, employed in different test programs, are presented both in graphical form and as coefficients of Fourier series - a proposed standard representation for imperfection data.
Author

N80-16375# Oklahoma Univ., Norman. School of Aerospace, Mechanical and Nuclear Engineering.
A PENALTY PLATE-BENDING ELEMENT FOR THE ANALYSIS OF LAMINATED ANISOTROPIC COMPOSITE PLATES
J. N. Reddy Aug. 1979 36 p refs
(Contract N00014-78-C-0647)
(AD-A074236; OU-AMNE-79-14; TR-6) Avail: NTIS HC A03/MF A01 CSCL 12/1

A C degrees (penalty) finite element is developed for the equations governing the heterogeneous laminated plate theory of Yang, Norris and Stavsky. The YNS theory is a generalization of Mindlin's theory for homogeneous, isotropic plates to arbitrarily laminated anisotropic plates and includes shear deformation and rotary inertia effects. The present element can also be used in the analysis of thin plates by appropriately specifying the penalty parameter. A variety of problems are solved, including those for which solutions are not available in the literature, to show the material effects and the parametric effects of plate aspect ratio, length-to-thickness ratio, lamination scheme, number of layers and lamination angle on the deflections, stresses, and vibration frequencies. Despite its simplicity, the present element gives very accurate results.
GRA

N80-16376# Oklahoma Univ., Norman. School of Aerospace Mechanical and Nuclear Engineering.
FINITE-ELEMENT ANALYSIS OF LAMINATED BIOMODULUS COMPOSITE-MATERIAL PLATES
J. N. Reddy and W. C. Chao Aug. 1979 26 p refs
(Contract N00014-78-C-0647)
(AD-A074184; OU-AMNE-79-18; TR-7) Avail: NTIS HC A03/MF A01 CSCL 12/1

Finite-element analysis of the equations governing the small-deflection elastic behavior of thin plates laminated of anisotropic bimodulus materials (which have different elastic stiffnesses depending upon the sign of the fiber-direction strain) is presented. Single-layer and two-layer cross-ply, simply-supported rectangular plates subjected to sinusoidally distributed normal pressure and uniformly distributed normal pressure are analyzed. For the sinusoidally loaded case, the finite-element solutions are gratifyingly close to the exact closed-form solutions.
GRA

N80-16377# Virginia Military Inst. Research Labs., Lexington.
INVESTIGATION OF THE SUITABILITY OF THE BAZANT ENDOCHRONIC MATERIAL MODEL FOR MODELLING THE CONCRETE IN A SAMSON ANALYSIS OF A REINFORCED CONCRETE BEAM Final Report, Jan. - May 1979
James W. Jeter, Jr. Jul. 1979 20 p refs
(Grant AF-AFOSR-0066-79; AF Proj. 2307)
(AD-A074202) Avail: NTIS HC A02/MF A01 CSCL 13/3

This investigation involved evaluating the potential of the Bazant endochronic plain concrete model as a possible avenue to an accurate model of the behavior of dynamically loaded reinforced concrete structures. A previous attempt to apply this model to the problem of a dynamically loaded beam was unsuccessful, due to an instability in the computer formulation of the model. In this study it was found that interaction between the tensile cracking model and the SAMSON nonlinear dynamic finite element structural analysis program used for the beam analysis problem resulted in inconsistent definition of the strain behavior experienced by the material, thereby producing instability. A procedure was developed and demonstrated, which successfully eliminated the instability.
GRA

N80-16378# General Dynamics Corp. Fort Worth, Tex.
FASTENER HOLE QUALITY, VOLUME 2 Final Technical Report, Jun. 1976 - Oct. 1978
P. J. Noronha, S. P. Henslee, D. E. Gordon, Z. R. Wolanski, and B. G. W. Yee Wright-Patterson AFB, Ohio AFFDL Dec. 1978 405 p
(Contract F33615-76-C-3113; AF Proj. 486U)
(AD-A074730; FZM-6809-Vol-2; AFFDL-TR-78-206-Vol-2)
Avail: NTIS HC A18/MF A01 CSCL 13/5

This report describes the development of the EIFS (Equivalent Initial Flaw Size) concept as a potential design tool and the generation of EIFS data as a function of several manufacturing and design variables. Several factors or mechanisms that strongly affected the fatigue behavior of fastener holes have been identified and corrected to achieve a 100% improvement in fatigue life. Some of these improvements are being implemented in the F-16 production program and the improved drilling will be implemented in the C5A-H Mod Program.
GRA

N80-16379# Naval Ship Research and Development Center, Bethesda, Md.
DESIGN EQUATION FOR TRIPPING OF STIFFENERS UNDER IN PLANE AND LATERAL LOADS Final Report
John C. Adamchak Jan. 1979 98 p refs
(SF43422593)
(AD-A074752; DTNSRDC-79/064) Avail: NTIS

HC A05/MF A01 CSCL 13/13

A series of design oriented equations to predict the tripping (lateral-torsional instability) of stiffeners under inplane and lateral loads has been developed which will allow this mode of failure to be more comprehensively addressed in the early stages of structural design. This type of failure is characterized by a twisting of the stiffener about its line of attachment to the plating and has been demonstrated by some recent British grillage tests to have serious potential as a primary mode of failure. The solutions developed take into account the effects of the rotational resistance provided by the plating to which the stiffener is attached, non-linear material and structural behavior by means of a tangent modulus type approach, and stiffener web deformations (for inplane loading). The equations are suitable for manual calculations but particularly powerful applications are possible when they are teamed up with a desk-top type mini-computer. GRA

N80-16380# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.

STRUCTURE INELASTICITY 24. EXAMPLES OF NON-UNIQUENESS IN CONTAINED PLASTIC DEFORMATION

Philip G. Hodge, Jr. and David L. White Jul. 1979 21 p

(Contract N00014-75-C-0177)

(AD-A074727; AEM-H1-24) Avail: NTIS HC A02/MF A01 CSCL 20/11

It is well known that in a well-defined boundary-value problem for an elastic/perfectly-plastic structure the displacements are unique if the structure is everywhere elastic, and they are not unique at the yield-point load. The present paper is concerned with the range of contained plastic deformation between these two extremes. Several examples are given in which more than one displacement field exists for loads less than the yield-point load. The significance of this phenomenon is commented on from a physical, mathematical, and computational point of view. GRA

N80-16381# Utah Univ., Salt Lake City. Dept. of Chemistry.

ENERGY DISPERSION AND RELAXATION IN PROPYNAL USING LASER IR/VISIBLE DOUBLE RESONANCE

M. L. Lesiecki, G. R. Smith, J. A. Stewart, and W. A. Guillory 1979 17 p refs Presented at the 14th European Congr. on Molecular Spectry., Frankfort, 3 Sep. 1979

(Contract ER-78-S-02-4695)

(COO-4695-2; CONF-790919-1) Avail: NTIS HC A02/MF A01

The dynamics of energy dispersion in propynal were studied over the pressure range of 5 to 500 mtorr following excitation by a TEA CO2 laser below the dissociation threshold. Wavelength resolved spectra, using the dye laser-induced fluorescence technique, are used to characterize the vibrational levels that are involved in the various energy transfer processes, while time-resolved spectra are used to determine the corresponding rates. The rate constants are extrapolated to zero pressure to obtain the regime of collisionless intramolecular relaxation time. Mechanisms of energy dispersion involving each of the probed vibrational levels are discussed. DOE

N80-16382# California Univ., Livermore. Lawrence Livermore Lab.

ACOUSTIC EMISSION GENERATED IN UNFLAWED 7075-T651 ALUMINUM UNDER UNIFORM BIAXIAL LOADING

M. A. Hamstad, R. G. Patterson, and A. K. Mukherjee 29 Dec. 1978 15 p refs Presented at the 9th World Conf. on Nondestructive Testing, Melbourne, 18-23 Nov. 1979

(Contract W-7405-eng-48)

(UCRL-81030; CONF-791101-3) Avail: NTIS HC A02/MF A01

A tubular specimen for acoustic emission testing of unflawed metals under uniaxial or biaxial loading was designed. The test technique and specimen design using 7075-T651 aluminum were evaluated. Biaxial results differed significantly from uniaxial results. DOE

N80-16383# California Univ., Livermore. Lawrence Livermore Lab.

IDENTIFICATION, DETECTION AND VALIDATION OF VIBRATING STRUCTURES: A SIGNAL PROCESSING APPROACH

J. V. Candy and D. L. Lager 18 Sep. 1979 58 p refs

(Contract W-7405-eng-48)

(UCID-18270) Avail: NTIS HC A04/MF A01

The application of modern signal processing techniques to characterize parameters governing the vibrational response of a structure is presented. Simulated response data is used to explore the feasibility of applying these techniques to various structural problems. On-line estimator/indentifiers are used to estimate structural parameters, validate designed structures, and detect structural failure when used with a detector. DOE

N80-16384# Argonne National Lab., Ill.

EFFECTS OF CRACKS ON THE RESPONSE OF SHELL STRUCTURES

H. J. Petroski 1979 10 p refs Presented at Intern. Conf. on Structural Mech. in Reactor Technol., Berlin, 13 Aug. 1979

(Contract W-31-109-eng-38)

(CONF-790802-57) Avail: NTIS HC A02/MF A01

A simple model that predicts the effects of axial cracks on the elastic deformation of thin cylindrical shells is developed. The model employs Fourier series representations for the deformation components of the shell and represents a crack by pairs of concentrated couples at the crack location. These couples induce bending modes of deformation, with the lower order bending modes dominating the response. Hence excellent results can be obtained with only about 25 bending models superimposed on the axisymmetric breathing mode, which alone characterizes the response of an uncracked shell to an axisymmetric pressure load. The model can be calibrated from a single static finite element analysis of the shell of interest. The calibrated model then accurately predicts the effects of different numbers, sizes, and locations of cracks under both static and dynamic loading of the shell. DOE

N80-16385# General Atomic Co., San Diego, Calif.

INFLUENCES OF THE COUPLE-STRESSES ON THE PURE-BENDING OF A CIRCULAR CYLINDER

B. G. Kao, F. K. Tzung, and F. H. Ho Jul. 1979 46 p refs

(Contract EY-76-C-03-0167)

(GA-A-15141) Avail: NTIS HC A03/MF A01

The solution to the pure-bending of a circular cylinder with the couple-stress theory of linear elasticity is presented. A linear bending moment-curvature relation is derived parallel to the classical beam theory. The section modulus (or the proportional coefficient) associated with the couple-stress theory is always greater than that predicted by the classical theory, and the ratio of the former to the latter increases as the radius of the beam decreases. These aspects clearly agree with the observed behavior of nuclear-grade graphite. Based on the solution, it is further estimated that the characteristic length of the couple-stress theory for H-451 graphite ranges from 0.62 to 1.54 mm. This range concurs with the magnitude of the grain size (maximum is 1.57 mm for H-451 graphite) and agrees with an aspect of the couple-stress theory. DOE

N80-16386# Sandia Labs., Albuquerque, N. Mex. Telemetry Components and Transducers Div.

LIMITATIONS AND CORRECTIONS IN MEASURING DYNAMIC CHARACTERISTICS OF STRUCTURAL SYSTEMS

P. L. Walter Oct. 1978 250 p refs

(Contract EY-76-C-04-0789)

(SAND-78-1015) Avail: NTIS HC A11/MF A01

Limitations encountered in measuring the dynamic characteristics of structural systems are discussed. Structural loading and response were measured by transducers possessing multiple resonant frequencies in their transfer function. In transient environments, the resultant signals from these transducers are shown to be analytically unpredictable in amplitude level and frequency content. Data recorded during nuclear effects simulation testing on structures were analyzed. Results of analysis can be generalized to any structure which encounters dynamic loading. Methods to improve the recorded data are described which can be implemented on a frequency selective basis during the measurement process. These improvements minimize data distortion attributable to the transfer characteristics of the measuring transducers. DOE

N80-16387# Babcock and Wilcox Co., Alliance, Ohio. Research and Development Div.
CONSISTENT CREEP AND RUPTURE PROPERTIES FOR CREEP-FATIGUE EVALUATION
C. C. Schultz 1978 80 p refs Presented at the ASME Meeting, San Francisco, 10 Dec. 1978
(Contract EY-76-C-15-0003)
(CONF-781202-21) Avail: NTIS HC A05/MF A01

The currently accepted practice of using inconsistent representations of creep and rupture behaviors in the prediction of creep-fatigue life is shown to introduce a factor of safety beyond that specified in current ASME Code design rules for 304 stainless steel Class 1 nuclear components. Accurate predictions of creep-fatigue life for uniaxial tests on a given heat of material were obtained by using creep and rupture properties for that same heat of material. The use of a consistent representation of creep and rupture properties for a minimum strength heat is also shown to provide adequate predictions. The viability of using consistent properties (either actual or those of a minimum heat) to predict creep fatigue life thus identifies significant design uses for the results of characterization tests and improved creep and rupture correlations. DOE

N80-16388# Brown Univ., Providence, R. I. Div. of Engineering.
TENSILE CRACKS IN CREEPING SOLIDS
H. Riedel (Max-Planck-Institut feur Eisenforschung, Dusseldorf) and J. R. Rice Feb. 1979 34 p refs
(Contract EY-76-S-02-3084)
(COO-3084-64) Avail: NTIS HC A03/MF A01

The loading parameter determining the stress and strain fields near a crack tip, and thereby the growth of the crack, under creep conditions is discussed. Relevant loading parameters considered are the stress intensity factor K/sub I/, the path-independent integral C*, and the net section stress sigma/sub net/. The material behavior is modelled as elastic-nonlinear viscous where the nonlinear term describes power law creep. At the time t = 0 load is applied to the cracked specimen, and in the first instant the stress distribution is elastic. Subsequently, creep deformation relaxes the initial stress concentration at the crack tip, and creep strains develop rapidly near the crack tip. Besides several methods of estimating the creep zone size, a convenient expression for a characteristic time is derived, which characterizes the transition from small scale yielding to extensive creep of the whole specimen. DOE

N80-16200*# General Electric Co., Utica, N. Y. Aircraft Equipment Div.
PROBABILITY OF FAILURE PREDICTION FOR STEP-STRESS FATIGUE UNDER SINE OR RANDOM STRESS
Ronald G. Lambert *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 31-41 refs (For primary document see N80-16198 07-31)
Avail: NTIS HC A09/MF A01 CSCL 20L

N80-16201*# Martin Marietta Corp., Denver, Colo.
ON THE USE OF COHERENCE FUNCTIONS TO EVALUATE SOURCES OF DYNAMIC EXCITATION
Stanley Barrett *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 43-58 refs (For primary document see N80-16198 07-31)
(Contract NAS1-14370)
Avail: NTIS HC A09/MF A01 CSCL 20K

N80-16204*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SNAPS IN STRUCTURES
Michail Zak *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 83-87 refs (For primary document see N80-16198 07-31)
(Contract NAS7-100)
Avail: NTIS HC A09/MF A01 CSCL 20K

N80-16205*# SRI International Corp., Menlo Park, Calif.
A SIMPLIFIED METHOD OF EVALUATING THE STRESS WAVE ENVIRONMENT OF INTERNAL EQUIPMENT
J. D. Colton and T. P. Desmond *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 89-96 refs (For primary document see N80-16198 07-31)
Avail: NTIS HC A09/MF A01 CSCL 20K

N80-16206*# Motorola, Inc., Scottsdale, Ariz. Government Electronics Div.
HIGH G PYROTECHNIC SHOCK SIMULATION USING METAL-TO-METAL IMPACT
Monty Bai and Wesley Thatcher *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 97-100 (For primary document see N80-16198 07-31)
Avail: NTIS HC A09/MF A01 CSCL 20K

N80-16208*# Southwest Research Inst., San Antonio, Tex.
BLAST FROM BURSTING FRANGIBLE PRESSURE SPHERES
E. D. Esparza and W. E. Baker *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 1 Sep. 1979 p 127-139 refs (For primary document see N80-16198 07-31)
(Grant NsG-3008)
Avail: NTIS HC A09/MF A01 CSCL 20K

N80-16212*# Martin Marietta Corp., Denver, Colo.
AN IMPEDANCE TECHNIQUE FOR DETERMINING LOW FREQUENCY PAYLOAD ENVIRONMENTS
Kenneth R. Payne *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 1-14 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 22B

N80-16213*# Martin Marietta Corp., Denver, Colo.
A STATISTICAL LOOK AT MODAL DISPLACEMENT RESPONSE TO SEQUENTIAL EXCITATIONS
William J. Karena *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 15-18 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20K

N80-16214*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
ON DETERMINING THE NUMBER OF DOMINANT MODES IN SINUSOIDAL STRUCTURAL RESPONSE
W. L. Hallauer, Jr. and A. Franck *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 19-34 refs (For primary document see N80-16211 07-31)
(Grant NsG-1276)
Avail: NTIS HC A10/MF A01 CSCL 20K

N80-16218*# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
COMPUTER AIDED DESIGN OF PASSIVE VIBRATION ISOLATORS FOR AIRBORNE ELECTRO-OPTICAL SYSTEMS
P. W. Whaley and Jerome Pearson (AFFDL) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 81-86 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20K

N80-16220*# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
A SIMPLE LOW-COST TECHNIQUE FOR MEASURING MATERIAL DAMPING BEHAVIOR
David I. G. Jones *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 97-103 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20K

N80-16222*# Army Construction Engineering Research Lab., Champaign, Ill.
LIQUID SPRING SHOCK ISOLATOR MODELING BY SYSTEM IDENTIFICATION
P. N. Sonnenburg, B. H. Wendler, and W. E. Fisher *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 119-134 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20D

N80-16223*# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A GENERALIZED DERIVATIVE MODEL FOR AN ELASTOMER DAMPER
Ronald L. Bagley and Peter J. Torvik *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 135-143 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20K

N80-16224*# Michigan State Univ., East Lansing. School of Packaging.
SHOCK RESPONSE OF NON-LINEAR SYSTEMS
Kalman Peleg *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 145-157 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20K

N80-16225*# Brookhaven National Lab., Upton, N. Y.
STABILITY ANALYSIS AND RESPONSE CHARACTERISTICS OF TWO-DEGREE OF FREEDOM NONLINEAR SYSTEMS
M. Subudhi and J. R. Curreri In Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 159-163 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20K

N80-16227*# California Univ., Berkeley. Structural Engineering and Structural Mechanics Div.
SHOCK SPECTRA DESIGN METHODS FOR EQUIPMENT-STRUCTURE SYSTEMS
James M. Kelly and Jerome L. Sackman *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 171-176 refs (For primary document see N80-16211 07-31) (Contract DNA001-C-0233; Grant NSF ENG-77-05197)
Avail: NTIS HC A10/MF A01 CSCL 20K

N80-16230*# Naval Surface Weapons Center, White Oak, Md.
A STABILITY THEOREM FOR A DYNAMICALLY LOADED LINEAR VISCOELASTIC STRUCTURE
D. W. Nicholson *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 203-208 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20K

N80-16231*# Michigan State Univ., East Lansing. School of Packaging.
ANALOG DOUBLE INTEGRATION OF SHOCK PULSES
Kalman Peleg and Richard A. Lund (MTS Systems Corp., Minneapolis, Minn.) *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 209-217 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 20K

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see 35 Instrumentation and Photography.

N80-16389 Stanford Univ., Calif.
OPTIMIZATION TECHNIQUES AND NUMERICAL METHODS FOR AQUIFER MANAGEMENT Ph.D. Thesis
Eduardo A. Aguado 1979 189 p
Avail: Univ. Microfilms Order No. 8002308

Integrated, self-contained models in which the physical behavior and functioning of the groundwater system is truly part of the optimization management model were developed. The partial differential equations describing groundwater flow are approximated by finite differences and the resulting linear algebraic simultaneous equations are imbedded as constraints in a linear programming formulation which can include economical, political, or social, quantifiable decision variables and constraints. The optimal plan for dewatering a construction site is determined and the method is applied to a conceptual, medium-sized sea-water intrusion problem. The optimal strategy for preventing encroachment of sea water in a coastal aquifer while maintaining fresh-water extraction at prescribed levels, is also determined.

Dissert. Abstr.

N80-16390 Wisconsin Univ. - Madison.
MEASUREMENT OF EDDY DIFFUSIVITY AND SOLUTE TRANSPORT THROUGH THE NEAR-SEDIMENT BOUNDARY LAYER OF ICE-COVERED LAKES, USING RADON-222 Ph.D. Thesis
John Ammiel Colman 1979 222 p
Avail: Univ. Microfilms Order No. 7927166

A technique for calculating vertical solute transport through the benthic boundary layer using a mathematical comparison of solute and Rn-222 profiles was investigated. The profile comparison was based on relating the vertical eddy diffusivities calculated from the Rn-222 profiles to the depth gradient of a solute's concentration. The relationship between vertical solute transport and solute flux through the sediment-water interface was also investigated. The sediment contribution during the winter to the net change in solute standing crop was computed from water column solute budgets and compared to changes predicted from vertical solute transport calculations. The comparison indicates some solutes released from the sediments during the winter period are not conservative in the water column.

Dissert. Abstr.

N80-16391*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
DIGITAL PROCESSING OF LANDSAT MSS AND TOPOGRAPHIC DATA TO IMPROVE CAPABILITIES FOR COMPUTERIZED MAPPING OF FOREST COVER TYPES Annual Report, 16 Dec. 1978 - 15 Jan. 1979
R. M. Hoffer, M. D. Fleming, L. A. Bartolucci, S. M. Davis, and R. F. Nelson, Principal Investigators 15 Jan. 1979 169 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS9-15508)
(E80-10041; NASA-CR-160379; LARS-TR-011579) Avail: NTIS HC A08/MF A01 CSCL 08B

There are no author-identified significant results in this report.

N80-16392*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EVALUATION OF REGISTRATION, COMPRESSION, AND CLASSIFICATION ALGORITHMS. VOLUME 2: DOCUMENTATION
R. Jayroe, Principal Investigator, R. Atkinson, L. Callas, J. Hodges, B. Gaggini, and J. Peterson Feb. 1979 331 p refs ERTS
(E80-10042; NASA-TM-78227) Avail: NTIS HC A15/MF A01 CSCL 08B

There are no author-identified significant results in this report.

N80-16393*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
COMPUTER-AIDED PROCESSING OF LANDSAT MSS DATA FOR CLASSIFICATION OF FORESTLANDS
Ross F. Nelson and Roger M. Hoffer, Principal Investigators Oct. 1979 103 p refs ERTS
(Contract NAS9-15508)
(E80-10043; NASA-CR-160381; LARS-TR-102679) Avail: NTIS HC A06/MF A01 CSCL 02F

There are no author-identified significant results in this report.

N80-16394*# Lockheed Electronics Co., Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). THE BOUNDARY PIXEL STUDY IN KANSAS AND NORTH DAKOTA
D. T. Register, Principal Investigator and A. L. Ona Sep. 1979 34 p refs Sponsored by NASA, NOAA, and USDA ERTS
(Contract NAS9-15800)
(E80-10044; NASA-CR-160365; JSC-14563; LEC-12828) Avail: NTIS HC A03/MF A01 CSCL 08B

The author has identified the following significant results. The statistical mapping approach to handling boundary pixels can be used as a standard for objectively comparing the cluster based technique, the maximum likelihood estimate based technique, and multicategory labeling.

N80-16395*# Lockheed Electronics Co., Houston, Tex. Systems and Services Div.
AS-BUILT DESIGN SPECIFICATION OF SOFTWARE FOR CLUSTER-BASED PROPORTION ESTIMATION
Nim-yau Chu, Principal Investigator Oct. 1979 174 p ERTS
(Contract NAS9-15800)
(E80-10045; NASA-CR-160366; LEC-13934; JSC-16239) Avail: NTIS HC A08/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N80-16396*# Maryland Univ., College Park. Dept. of Civil Engineering.
RELATIONSHIP OF PHYSIOGRAPHY AND SNOW AREA TO STREAM DISCHARGE Final Report, 1 Nov. 1976 - 31 May 1979
Richard H. McCuen, Principal Investigator Oct. 1979 146 p refs ERTS
(Grant NGR-21-002-399)
(E80-10046; NASA-CR-162506) Avail: NTIS HC A07/MF A01 CSCL 08L

The author has identified the following significant results. A comparison of snowmelt runoff models shows that the accuracy of the Tangborn model and regression models is greater if the test data falls within the range of calibration than if the test data lies outside the range of calibration data. The regression models are significantly more accurate for forecasts of 60 days or more than for shorter prediction periods. The Tangborn model is more accurate for forecasts of 90 days or more than for shorter prediction periods. The Martinec model is more accurate for forecasts of one or two days than for periods of 3,5,10, or 15 days. Accuracy of the long-term models seems to be independent of forecast data. The sufficiency of the calibration data base is a function not only of the number of years of record but also of the accuracy with which the calibration years represent the total population of data years. Twelve years appears to be a sufficient length of record for each of the models considered, as long as the twelve years are representative of the population.

N80-16397*# Environmental Research and Technology, Inc., Concord, Mass.
INVESTIGATION OF THE APPLICATION OF HCMM THERMAL DATA TO SNOW HYDROLOGY Quarterly Progress Report, Oct. - Dec. 1979
James C. Barnes, Principal Investigator 7 Jan. 1980 7 p Sponsored by NASA ERTS
(E80-10049; NASA-CR-162521; QPR-9) Avail: NTIS HC A02/MF A01 CSCL 08L

There are no author-identified significant results in this report.

N80-16398*# Geological Survey, Denver, Colo.
GEOLOGIC APPLICATION OF THERMAL-INERTIA MAPPING FROM SATELLITE Progress Report, Sep. - Nov. 1979
Terry W. Offield, Principal Investigator, Susanne H. Miller, and Kenneth Watson Nov. 1979 20 p Sponsored by NASA ERTS
(E80-10050; NASA-CR-162522) Avail: NTIS HC A02/MF A01 CSCL 08B

There are no author-identified significant results in this report.

N80-16399*# Lockheed Electronics Co., Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). DETAILED DESCRIPTION OF THE WHEAT ACREAGE ESTIMATION PROCEDURE USED IN THE LARGE AREA CROP INVENTORY EXPERIMENT
Willa W. Austin, Principal Investigator Feb. 1978 43 p refs Sponsored by NASA, NOAA, and USDA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS9-15200)
(E80-10051; NASA-CR-160405; LEC-11497) Avail: NTIS HC A03/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N80-16400*# Lockheed Electronics Co., Houston, Tex.
LARGE AREA CROP INVENTORY EXPERIMENT (LACIE). PROFILE SIMILARITY FEASIBILITY STUDY
Charles V. Nazare, Principal Investigator Oct. 1979 44 p refs Sponsored by NASA, NOAA, and USDA ERTS
(Contract NAS9-15800)
(E80-10052; NASA-CR-160406; JSC-16246; LEC-14010) Avail: NTIS HC A03/MF A01 CSCL 02C

There are no author-identified significant results in this report.

N80-16401*# National Conference of State Legislatures, Denver, Colo.
NCSL REMOTE SENSING PROJECT Final Report, 15 Jul. 1978 - 20 Sep. 1979
Paul A. Tessar, Principal Investigator 20 Sep. 1979 88 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NASw-3230)
(E80-10053; NASA-CR-162523) Avail: NTIS HC A05/MF A01 CSCL 05B

There are no author-identified significant results in this report.

N80-16402*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A SPECTRAL FILTER FOR ESMR'S SIDELOBE ERRORS
Dennis Chesters Sep. 1979 26 p refs
(NASA-TM-80555) Avail: NTIS HC A03/MF A01 CSCL 08B

Fourier analysis was used to remove periodic errors from a series of NIMBUS-5 electronically scanned microwave radiometer brightness temperatures. The observations were all taken from the midnight orbits over fixed sites in the Australian grasslands. The angular dependence of the data indicates calibration errors consisted of broad sidelobes and some miscalibration as a function of beam position. Even though an angular recalibration curve cannot be derived from the available data, the systematic errors can be removed with a spectral filter. The 7 day cycle in the drift of the orbit of NIMBUS-5, coupled to the look-angle biases, produces an error pattern with peaks in its power spectrum at the weekly harmonics. About plus or minus 4 K of error is removed by simply blocking the variations near two- and three-cycles-per-week. R.E.S.

N80-16403*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE DIELECTRIC PROPERTIES OF SOIL-WATER MIXTURES AT MICROWAVE FREQUENCIES
J. R. Wang Dec. 1979 24 p refs Submitted for publication
(NASA-TM-80597) Avail: NTIS HC A02/MF A01 CSCL 08M

Recent measurements on the dielectric constants of soil-water mixtures show the existence of two frequency regions in which the dielectric behavior of these mixtures was quite different. At the frequencies of 1.4 GHz to 5 GHz, there were strong evidences that the variations of the dielectric (epsilon) with water content (W) depended on soil type. While the real part of epsilon for sandy soils rose rapidly with the increase in W, epsilon for the high-clay content soils rose only slowly with W. As a consequence, epsilon was generally higher for the sandy soils than for the high-clay content soils at a given W. On the other hand,

most of the measurements at frequencies < 1 GHz indicated the increase of epsilon with W independent of soil types. At a given W, epsilon" (sandy soil) approximately equals epsilon (high-clay content soil) within the precision of the measurements. These observational features can be satisfactorily interpreted in terms of a simple dielectric relaxation model, with an appropriate choice of the mean relaxation frequency f(m) and the range of the activation energy (beta). It was found that smaller f(m) and larger beta were required for the high-clay content soils than the sandy soils in order to be consistent with the measured data. *Author*

N80-16404*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

L-BAND RADAR SENSING OF SOIL MOISTURE

A. T. C. Chang, S. Atwater (California Univ., Santa Barbara), V. V. Salomonson, J. E. Estes (California Univ., Santa Barbara), D. S. Simonett (California Univ., Santa Barbara), and M. L. Bryan (JPL) Jan. 1980 32 p refs Submitted for publication (NASA-TM-80628) Avail: NTIS HC A03/MF A01 CSCL 08M

The performance of an L-band, 25 cm wavelength imaging synthetic aperture radar was assessed for soil moisture determination, and the temporal variability of radar returns from a number of agricultural fields was studied. A series of three overflights was accomplished over an agricultural test site in Kern County, California. Soil moisture samples were collected from bare fields at nine sites at depths of 0-2, 2-5, 5-15, and 15-30 cm. These gravimetric measurements were converted to percent of field capacity for correlation to the radar return signal. The initial signal film was optically correlated and scanned to produce image data numbers. These numbers were then converted to relative return power by linear interpolation of the noise power wedge which was introduced in 5 dB steps into the original signal film before and after each data run. Results of correlations between the relative return power and percent of field capacity (FC) demonstrate that the relative return power from this imaging radar system is responsive to the amount of soil moisture in bare fields. The signal returned from dry (15% FC) and wet (130% FC) fields where furrowing is parallel to the radar beam differs by about 10 dB. A.R.H.

N80-16405*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.

SYNTHETIC APERTURE RADAR/LANDSAT MSS IMAGE REGISTRATION

H. E. Maurer, ed., J. D. Oberholtzer, ed., and P. E. Anuta, ed. (Purdue Univ.) Jun. 1979 233 p Sponsored in part by Goodyear Aerospace Corp. Original contains color illustrations

(Contracts NAS8-2816; NAS8-2827)

(NASA-RP-1039) Avail: NTIS HC A11/MF A01 CSCL 17I

Algorithms and procedures necessary to merge aircraft synthetic aperture radar (SAR) and LANDSAT multispectral scanner (MSS) imagery were determined. The design of a SAR/LANDSAT data merging system was developed. Aircraft SAR images were registered to the corresponding LANDSAT MSS scenes and were the subject of experimental investigations. Results indicate that the registration of SAR imagery with LANDSAT MSS imagery is feasible from a technical viewpoint, and useful from an information-content viewpoint. J.M.S.

N80-16406*# National Aeronautics and Space Administration. National Space Technology Labs., Bay Saint Louis, Miss.

RADIATIVE TRANSFER MODELING APPLIED TO SEA WATER CONSTITUENT DETERMINATION

Kenneth H. Faller Dec. 1979 171 p

(NASA-TM-72736) Avail: NTIS HC A08/MF A01 CSCL 08J

Optical radiation from the sea is influenced by pigments dissolved in the water and contained in discrete organisms suspended in the sea, and by pigmented and unpigmented inorganic and organic particles. The problem of extracting the information concerning these pigments and particulates from the optical properties of the sea is addressed and the properties which determine characteristics of the radiation that a remote sensor will detect and measure are considered. The results of the application of the volume scattering function model to the data collected in the Gulf of Mexico and its environs indicate that the size distribution of the concentrations of particles found in the sea can be predicted from measurements of the volume scattering function. Furthermore, with the volume scattering function model and knowledge of the absorption spectra of dissolved pigments, the radiative transfer model can compute a distribution of particle sizes and indices of refraction and concentration of dissolved pigments that give an upwelling light spectrum that closely matches measurements of that spectrum at sea. A.R.H.

N80-16407*# City Univ. of New York, N. Y. Inst. of Marine and Atmospheric Sciences.

VERIFICATION PROCEDURES FOR THE SEASAT MEASUREMENTS OF THE VECTOR WIND WITH THE SASS

Willard J. Pierson Jan. 1978 39 p refs Sponsored by NASA Prepared for JPL

(Contracts JPL-954411; N00014-77-C-0206)

(NASA-CR-162469; AD-A073644) Avail: NTIS HC A03/MF A01

Various relationships between the friction velocity and the roughness length in boundary layer models are studied in terms of the verification of the SASS on SEASAT. It is shown that verification against a measured wind at a known anemometer height is preferable to verification against a theoretical value of the friction velocity. The effect of the different models is small when they are used to refer all measured winds to one elevation. A model is proposed that has the features of two quite different models and the height of the anemometer for verification purposes is recommended to be 19.5 meters. GRA

N80-16408# California Univ., Livermore. Lawrence Livermore Lab.

REMOTE SENSING FOR DIAGNOSING VAPOR DISPERSION IN SPILLS OF LIQUID ENERGY FUELS

L. G. Multhauf, A. M. Frank, and R. O. Koopman 23 Aug. 1979 53 p

(Contract W-7405-eng-48)

(UCID-18237) Avail: NTIS HC A04/MF A01

The measurement of gas concentrations in Liquid Energy Fuel (LEF) dispersion clouds by remote LIDAR sensing is an attractive alternative to the use of in situ instruments in regions where the gas concentration level is low. A comparison of Raman and DIAL LIDAR shows that Raman LIDAR is best suited to measure the concentration levels of interest in the LEF program. The LIDAR systems are limited primarily by the opaque fog produced by the evaporation of a cryogenic liquid fuel. The limitation is most severe for methane, for which LIDAR is not useful for concentrations above the flammability range. However, it is this low concentration region that the spatial extent of the cloud is large and not easily covered with an array. A fence of in situ instruments proposed for 40 cu m spills at China Lake (a row of 10 in situ instrument stations) and a Raman LIDAR system of similar cost designed to cover the same area of the cloud were compared. LIDAR offers substantially higher spatial resolution and coverage that better allows for wind variations. DOE

N80-16409# Juniata Coll., Huntingdon, Pa.

STUDY OF HYDROCARBON-SHALE INTERACTION

Progress Report, 1 Apr. - 30 Jun. 1979

P. D. Schettler, Jr. and D. L. Wampler 1979 50 p refs

(Contract EY-76-S-05-5197)

(ORO-5197-14; PR-14) Avail: NTIS HC A03/MF A01

Construction of an apparatus for degassibility/isotherm measurements up to 1000 psi is complete. Results of chromatographic analysis of off-gassing from wells KY No. 4-, PA No. 1-, PA No. 2-, OH No. 3-, and IL No. 4-EGSP are tabulated. Temperature coefficients of degassibility and isotherm parameters in Devonian shales were determined. A summary of degassibility/isotherm data is presented. A computer simulation of a matrix diffusion/fracture flow model in the radial case is discussed. A small infrared/X-ray diffraction study is proceeding on selected samples. DOE

N80-16410# Department of Energy, Morgantown, W. Va. Energy Technology Center.

GAS PRODUCTION OF DEVONIAN SHALE WELLS RELATIVE TO PHOTO LINEAMENT LOCATIONS: A STATISTICAL ANALYSIS

J. F. Howard (Howard and Associates, Owensboro, Ky.), S. J. Lahoda (West Virginia Univ., Morgantown), W. E. Zirk (West Virginia Univ., Morgantown), and C. A. Komar Apr. 1979 19 p refs

(METC/CR-79/28) Avail: NTIS HC A02/MF A01

A pilot study was made to relate Devonian shale gas well production to distance from photo lineaments that were mapped at two different scales, namely low altitude (1:24,000) and intermediate altitude (1:62,500). Cumulative production after 5 years for 41 wells located in the Vicco quadrangle of Perry Co., Kentucky, was used in the study. A statistical two-way analysis of variance design was used to group the data into four classes depending on whether the producing wells were within or beyond 300 feet of a photo lineament derived from both scales. Results indicate that cumulative 5 year production is higher for wells sited within 300 feet of a low-altitude photo lineament. The correlations indicate a narrow zone of influence or effect for the geologic feature represented by the photo lineament. Moreover, the most consistently effective features are derived from low-altitude (1:24,000) scale photography, well below the detail commonly utilized in studies to date. DOE

N80-16411# Department of Energy, Washington, D. C.

ENVIRONMENTAL DEVELOPMENT PLAN: UNDERGROUND COAL GASIFICATION

Sep. 1979 76 p Sponsored by DOE, Washington, D.C.

(DOE/EDP-0047) Avail: NTIS HC A05/MF A01

Early tests indicate that some of the groundwater pollution due to underground coal gasification (UCG) is confined to an area adjacent to the gasified zone and the cleansing properties of the surrounding coal may serve as a natural contaminant control system. Ground subsidence is another major concern. Subsidence could cause disruption of aquifers, surface disturbance, and loss of product gas through cracks to the surface. Degradation of air quality is also a significant concern particularly with respect to emissions through cracks and fissures resulting from anticipated subsidence. Potential hazards to the worker exist, including the inadvertent release of gas through cracks in the ground surface and worker safety associated with the sudden collapse through subsidence. Environmental regulations which will most directly affect the UCG program include the Federal Water Pollution Control Act, the Safe Drinking Water Act, and the Clean Air Act. These regulations will impact upon pollution control requirements, and potential siting of facilities. DOE

N80-16412# Battelle Pacific Northwest Labs., Richland, Wash.

COLLECTION AND ANALYSIS OF VEGETATIVE COVER DATA

R. H. Sauer and S. L. Owzarski Jul. 1979 24 p refs

(Contract EY-76-C-06-1830)

(PNL-3068) Avail: NTIS HC A03/MF A01

The rationale, methods, and analytic tools that are commonly used to study changes in vegetation on the Hanford Site are discussed. The method of vegetation analysis that has been successful in the Columbia Basin in Washington State is Daubenmire's (1959) canopy cover approach. Six classes are recognized in use. The percentage cover of each species present is estimated and placed in one of the six classes. The advantage of placing the cover of a species into broad classes instead of making more accurate estimates is that it allows faster data collection. The error is reduced with many samples (usually 50) because the actual value in some samples will be less than the midpoint, and others, greater than the midpoint. The midpoint value is used to calculate the statistics of canopy cover. A FORTRAN listing of the program cover and sample output, consisting of a data listing, frequency, cover statistics, and species diversity for each line is given in the appendix. DOE

N80-16413# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

BACKSCATTER RESPONSE OF SNOW COVERED ROADS AND ROADSIDE SURFACES

F. T. Ulaby and W. H. Stiles Aug. 1979 67 p refs

(Contract EY-76-C-04-0789)

(SAND-79-7046; RSL-TR-377-2) Avail: NTIS HC A04/MF A01

The angular response of the backscatter coefficient for snow covered targets was measured with a microwave action spectrometer. Snow under varying conditions on compacted dirt, short grass, asphalt and concrete surfaces was observed. The measurements were made for three linear polarizations (HH, HV, and VV) and at three frequencies (8.6, 17.0 and 35.6 GHz). The data was compared with measurements in the absence of snow. The general effect of wet or dry snow was observed to be a decrease in the total response dynamic range and therefore an increased difficulty in target discrimination. DOE

N80-16414# Geological Survey, Harrisburg, Pa. Water Resources Div.

FLOW ROUTING IN THE SUSQUEHANNA RIVER BASIN. PART 2: LOW-FLOW FREQUENCY CHARACTERISTICS OF THE SUSQUEHANNA RIVER BETWEEN WAVERLY, NEW YORK AND SUNBURY, PENNSYLVANIA

Donald L. Bringham Jun. 1979 38 p refs Prepared in cooperation with Susquehanna River Basin Commission, Harrisburg, Pa.

(PB-301392/7; USGS/WRI-79/52; USGS/WRD/WRI-79/067) Avail: NTIS HC A03/MF A01 CSCL 08H

Six flow-routing models were developed, calibrated, and verified for the Susquehanna river between Waverly, New York, and Sunbury, Pennsylvania. The models were used to simulate a 32 year record of daily flows at two ungaged sites. Low flow frequency curves for simulated flows were used to estimate 7 day low flows at the 10 year recurrence interval. The mopst errors, differences between model results and observed streamflow at gaged sites, are considered to be within reasonable limits and overall quality of simulated streamflow and low flow frquency curves is considered good. GRA

N80-16415# Geological Survey, Harrisburg, Pa. Water Resources Div.

FLOW ROUTING IN THE SUSQUEHANNA RIVER BASIN. PART 3: ROUTING RESERVOIR RELEASES IN THE TIOGA AND CHEMUNG RIVERS SYSTEM, PENNSYLVANIA AND NEW YORK Final Report

Jeffrey T. Armbruster Jul. 1979 42 p refs Prepared jointly with Susquehanna River Basin Commission, Harrisburg, Pa.

(PB-301393/5; USGS/WRI-79/85; USGS/WRD/WRI-79/068) Avail: NTIS HC A03/MF A01 CSCL 08H

Channel-routing models were used to route hypothetical releases from reservoirs in the upper Tioga River basin, Pennsylvania. The models used to route the flows of Cohocton and Chemung Rivers accounted for bank-storage discharge and streamflow depletion by well pumpage. Three hypothetical reservoirs releases were made from the reservoirs and routed to Wilkes-Barre, Pennsylvania. The first hypothetical release investigated was a constant 100 cubic feet per second, and the second release was a constant 70 cubic feet per second. The third scheme was a hypothetical release of 100 cubic feet per second for three days followed by a constant 70 cubic feet per second for the duration of the period considered. The third release scheme was generally the most efficient of the three schemes tested. GRA

N80-16416# Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering.

IRRIGATION PRACTICES AND RETURN FLOW SALINITY IN GRAND VALLEY Final Report

Gaylord V. Skogerboe, David McWhorter, and James E. Ayars Aug. 1979 220 p refs

(Grant EPA-S-800687)

(PB80-103609; EPA-600/2-79-148) Avail: NTIS HC A10/MF A01 CSCL 02C

The relationships between leachate volume and chemical quality were evaluated. A numerical model of soil moisture and salt transport was used. Field data were collected on 63 research plots located in the Grand Valley, Colorado. From the calibration of the moisture flow model using infiltration data, water content profiles and storage change data, it was concluded that soil moisture flow could be adequately modeled for the Grand Valley. From comparisons of field and simulated data used in evaluating the soil chemistry model, it was concluded that total dissolved solids (TDS) concentrations were adequately modeled but that individual ionic species concentrations were not. The TDS profile calculated at the beginning and end of the growing season show

the salt concentration in the profile below the root zone to be relatively constant. GRA

N80-16417# Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.

TOWARD CLASSIFICATION AND RATIONALE FOR WATERSHED MANAGEMENT AND STREAM PROTECTION Final Report

Charles E. Warren Jun. 1979 148 p refs (Grant EPA-R-805423)

(PB80-103153; EPA-600/3-79-059) Avail: NTIS HC A07/MF A01 CSCL 08H

A rationale for developing a classification system for watershed management is given. A hierarchical classification is developed that is based on the potentials and environments of systems, especially on the capacities of watersheds and streams to remain in desirable states over relatively long times and to return to desirable states over relatively short times. The suggested approach is to classify headwater streams by using extant knowledge of biogeoclimatic regions, watershed environments, stream order, and the morphological capacities of stream beds. GRA

N80-16418# Geological Survey, Anchorage, Alaska. Water Resources Div.

WATER RESOURCES DATA OF THE SEWARD AREA, ALASKA Final Report

L. L. Dearborn, G. S. Anderson, and Chester Zenone Dec. 1978 52 p refs Prepared in cooperation with Alaska Dept. of Natural Resources, Anchorage

(PB80-101298; USGS/WRI-79/11; USGS/WRD/WRI-79/077) Avail: NTIS HC A04/MF A01 CSCL 13B

Water resources data collected in the Seward, Alaska area at various times since 1941 are presented. The present development and use of Seward's water resources are reviewed and alternative sources and methods for further development of the water supplies are discussed. The hydrological setting of Seward is examined and the water availability and water quality are discussed. A.W.H.

N80-16419# Environmental Monitoring and Support Lab., Las Vegas, Nev.

PHYTOPLANKTON WATER QUALITY RELATIONSHIPS IN US LAKES. PART 1: METHODS, RATIONALE AND DATA LIMITATIONS

W. D. Taylor, L. R. Williams, S. C. Hern, V. W. Lambou, F. A. Morris (Nevada Univ., Las Vegas), and M. K. Morris (Nevada Univ., Las Vegas) Mar. 1979 81 p refs

(PB-298439/1; EPA-600/3-79-021-Pt-1) Avail: NTIS HC A05/MF A01 CSCL 13B

The physical, chemical, and morphometric conditions of 250 lakes are described. The mechanics and logic of interfacing physical and chemical data (total phosphorus; orthophosphorus; nitrite-nitrate-, ammonia-, and total Kjeldahl-nitrogen; nitrogen/phosphorus ratio; Secchi disk transparency; chlorophyll a; turbidity; pH; total alkalinity; dissolved oxygen; and temperature) with biological data to establish the environmental requirements and the relative importance of phytoplankton are described. GRA

N80-16420# Environmental Monitoring and Support Lab., Las Vegas, Nev.

PHYTOPLANKTON WATER QUALITY RELATIONSHIPS IN US LAKES. PART 2: GENERA ACANTHOSPHAERA THROUGH CYSTODINIUM COLLECTED FROM EASTERN AND SOUTHEASTERN LAKES

L. R. Williams, S. C. Hern, V. W. Lambou, F. A. Morris (Nevada Univ., Las Vegas), M. K. Morris (Nevada Univ., Las Vegas), and W. D. Taylor Mar. 1979 130 p refs

(PB-298440/9; EPA-600/3-79-022-Pt-2) Avail: NTIS HC A07/MF A01 CSCL 13B

Water quality relationships for about 180 genera and 700 species and varieties of phytoplankton were determined from data collected in 17 eastern and southeastern States during 1973. This report presents environmental requirements and relative abundance of 54 phytoplankton genera: Acanthosphaera through Cystodinium. GRA

N80-16421# Environmental Monitoring and Support Lab., Las Vegas, Nev.

PHYTOPLANKTON WATER QUALITY RELATIONSHIPS IN US LAKES. PART 3: GENERA DACTYLOCOCCOPSIS THROUGH GYROSIGMA COLLECTED FROM EASTERN AND SOUTHEASTERN LAKES

S. C. Hern, V. M. Lambou, F. A. Morris (Nevada Univ., Las Vegas), M. K. Morris (Nevada Univ., Las Vegas), W. D. Taylor, and L. R. Williams Mar. 1979 95 p refs

(PB-298441/7; EPA-600/3-79-023-Pt-3) Avail: NTIS HC A05/MF A01 CSCL 13B

Water quality relationships for about 180 genera and 700 species and varieties of phytoplankton were determined from data collected in 17 eastern and southeastern States during 1973. Environmental requirements and relative abundance are presented for 34 phytoplankton genera: Dactylococcopsis through Gyrosigma. GRA

N80-16422# Environmental Monitoring and Support Lab., Las Vegas, Nev.

PHYTOPLANKTON WATER QUALITY RELATIONSHIPS IN US LAKES. PART 4: GENERA HANTZCHIA THROUGH PTEROMONAS COLLECTED FROM EASTERN AND SOUTHEASTERN LAKES

V. W. Lambou, F. A. Morris (Nevada Univ., Las Vegas), M. K. Morris (Nevada Univ., Las Vegas), W. D. Taylor, L. R. Williams, and S. C. Hern Mar. 1979 115 p refs

(PB-298442/5; EPA-600/3-79-024-Pt-4) Avail: NTIS HC A06/MF A01 CSCL 13B

Water quality relationships for about 180 genera and 700 species and varieties of phytoplankton were determined from data collected in 17 eastern and southeastern States during 1973. Environmental requirements and relative abundance are presented for 47 phytoplankton genera: Hantzschia through Pteromonas. GRA

N80-16423# Environmental Monitoring and Support Lab., Las Vegas, Nev.

PHYTOPLANKTON WATER QUALITY RELATIONSHIPS IN US LAKES. PART 5: GENERA QUADRIGULA THROUGH ZYGNEMA COLLECTED FROM EASTERN AND SOUTHEASTERN LAKES

M. K. Morris (Nevada Univ., Las Vegas), W. D. Taylor, L. R. Williams, S. C. Hern, V. W. Lambou, and F. A. Morris (Nevada Univ., Las Vegas) Mar. 1979 108 p refs

(PB-298443/3; EPA-600/3-79-025-Pt-5) Avail: NTIS HC A06/MF A01 CSCL 13B

Water quality relationships for about 180 genera and 700 species and varieties of phytoplankton were determined from data collected in 17 eastern and southeastern States during 1973. This report presents environmental requirements and relative abundance of 45 phytoplankton genera: Quadrigula through Zygnema. GRA

N80-16424*# Illinois Inst. of Natural Resources, Springfield.

ILLINOIS LANDSAT FEASIBILITY STUDY

John A. Bishop Apr. 1979 94 p refs Sponsored by NASA (NASA-CR-162760; PB-300409/0; ILLDOE-79/13) Avail: NTIS HC A05/MF A01 CSCL 22A

Satellite remote sensing technology and its application to natural resources planning and management is discussed as well as the satellite's advantages and limitations for data gathering. Recommendations for its use in Illinois are suggested. GRA

N80-16425# Geological Survey, Albuquerque, N. Mex. Water Resources Div.

HYDROLOGIC DATA ON CHANNEL ADJUSTMENTS, 1970 TO 1975, ON THE RIO GRANDE DOWNSTREAM FROM COCHITI DAM, NEW MEXICO, BEFORE AND AFTER CLOSURE Final Report

J. D. Dewey, F. E. Roybal, and D. E. Funderburg May 1979 542 p refs

(PB-301134/3; USGS/WRD/WRI-79/065; USGS/WRI-79/70) Avail: NTIS HC A23/MF A01 CSCL 13B

Cross section channel profiles sediment transport, and hydrologic data were observed and computed for a series of pre-dam post-dam investigations from 1970 to 1975 at 37 cross sections established along a 59 mile (95 kilometer) study reach

from Cochiti Dam to Isleta Diversion Dam, New Mexico. Cochiti Dam began impounding water in November 1973. Because the dam will trap virtually all of the sediment load originating upstream and water discharge will be controlled, it is expected that equilibrium values of channel width, depth, slope and sediment-transport capability in the existing main stem of the Rio Grande will change. Changes in cross sections with time and space and changes in size distribution of sediments are documented. GRA

N80-16426# Bureau of Mines, Amarillo, Tex. Helium Operations.

HELIUM RESOURCES OF THE UNITED STATES, 1977

B. J. Moore 1979 31 p refs

(PB80-101744; BM-IC-8803) Avail: NTIS HC A03/MF A01 CSCL 08F

Helium resources of the U.S. as of January 1977 are estimated at 710 billion cubic feet. These resources are broken down into four classifications, as follows: helium in measured natural gas resources and in storage, 201 billion cubic feet; helium in indicated natural gas resources, 150 billion cubic feet; helium in hypothetical natural gas resources, 175 billion cubic feet; and helium in speculative natural gas resources, 184 billion cubic feet. Most of the helium in natural gas is presently dissipated as natural gas is consumed as fuel and for other purposes. GRA

N80-16427# National Center for Atmospheric Research, Boulder, Colo. Atmospheric Analysis and Prediction Div.

EDDYLESS CHANNEL FLOWS AND THEIR STABILITY

Stephen Jackson and James C. McWilliams Jul. 1979 61 p refs

(Grant NSF ATM-77-23757)

(PB80-104649; NCAR/TN-142) Avail: NTIS HC A04/MF A01 CSCL 20D

Numerical solutions are presented for steady flow in a zonal channel subjected to a meridionally varying zonal wind stress at the upper surface. The model used is adiabatic, hydrostatic, quasigeostrophic, and baroclinic with quadratic drag force at the lower boundary, vertical momentum diffusion in the interior, and a weak scale-selective horizontal momentum diffusion law. The solution technique is that of quasilinearization for the resulting nonlinear, two point boundary value problem. The steady solutions are also analyzed for their linearized stability to perturbations; they are found to be unstable for sufficiently strong wind stress and weak vertical momentum diffusion. GRA

N80-16428# Texas Dept. of Water Resources, Austin.

OCCURRENCE AVAILABILITY AND CHEMICAL QUALITY OF GROUND WATER IN THE EDWARDS PLATEAU REGION OF TEXAS

Llyod E. Walker Jul. 1979 334 p refs

(PB-299790/6; TDWR/R-235) Avail: NTIS HC A15/MF A01 CSCL 08H

The principal aquifers, or water-bearing units, in order of importance and development are the Edwards-Trinity (Plateau), composed of the Antlers Formation and the Edwards and associated limestones; the alluvium; the lower Cretaceous, composed of the Hosston, Sligo, Pearsall, and Glen Rose Formations; the Hickory; and the Ellenburger-San Saba. Other units that yield fresh to slightly saline water in limited areas on or near the Edwards Plateau are the Ogallala aquifer and rocks of Pennsylvania, Permian, and Triassic age. The total amount of fresh to slightly saline groump water available from all aquifers on the Edwards Plateau is more than 450,000 acre-feet per year. Of the amount, approximately 308,000 acre-feet is available annually from the Edwards-Trinity (Plateau) and the alluvium aquifers. GRA

N80-16429# Geological Survey, Reston, Va.

U.S. GEOLOGICAL SURVEY SOURCES OF PHOTOGRAPHS AND IMAGES OF BIOSPHERE RESERVES TAKEN FROM SPACECRAFT AND AIRCRAFT: YELLOWSTONE NATIONAL PARK

Janet Bonner 1979 117 p refs

(PB-301333/1) Avail: NTIS HC A06/MF A01 CSCL 08B

Computer listings of material available in photographic form showing scenes filmed by Skylab, LANDSAT, NASA aircraft, or on USGS mapping missions are presented. In the case of LANDSAT imagery, computer-compatible magnetic tapes are also available. A.R.H.

N80-16430# Geological Survey, Reston, Va.

U.S. GEOLOGICAL SURVEY SOURCES OF PHOTOGRAPHS AND IMAGES OF BIOSPHERE RESERVES TAKEN FROM SPACECRAFT AND AIRCRAFT: ROCKY MOUNTAIN NATIONAL PARK

Janet Bonner, comp. 1979 74 p

(PB-301334/9) Avail: NTIS HC A04/MF A01 CSCL 08B

Photographs and images of biosphere reserves taken from spacecraft and aircraft provide a significant data base showing broad views and details of the landscape and are invaluable in searching for chantes and trends in forest cover, water area, and other diagnostic landscape features. Each data report in this series lists remotely sensed data gathered from spacecraft and aircraft available for a single biosphere reserve. Computer listings of data are provided by the EROS Data Center of the U.S. Geological Survey, which contains in its archives all of the listed material in photographic form and, in the case of LANDSAT images, can make available computer-compatible magnetic tapes of any LANDSAT scene. GRA

N80-16431# Geological Survey, Harrisburg, Pa. Water Resources Div.

REGIONAL STOCHASTIC GENERATION OF STREAMFLOWS USING AN ARIMA (1,0,1) PROCESS AND DISAGGREGATION Final Report

Jeffrey T. Armbruster May 1979 63 p refs Prepared in cooperation with Susquehanna River Basin Commission, Harrisburg, Pa.

(PB-300945/3; USGS/WRD/WRI-79/058; USGS/WRI-79/3) Avail: NTIS HC A04/MF A01 CSCL 08H

An ARIMA (1,0,1) model was calibrated and used to generate long annual flow sequences at three sites in the Juniata River basin, Pennsylvania. The model preserves the mean, variance, and cross correlations of the observed station data. In addition, it has a desirable blend of both high and low frequency characteristics and therefore is capable of preserving the Hurst coefficient, h. The generated annual flows are disaggregated into monthly sequences using a modification of the Valencia-Schaake model. One hundred year sequences were generated and analyzed for their low flow characteristics. A method is proposed for synthesizing flows at ungaged sites. GRA

N80-16432# National Geodetic Survey, Rockville, Md.

HOACOS: A PROGRAM FOR ADJUSTING HORIZONTAL NETWORKS IN THREE DIMENSIONS

T. Vincenty Jul. 1979 18 p refs

(PB-301351/3; NOAA-TM-NOS-NGS-19; NOAA-79090405) Avail: NTIS HC A02/MF A01 CSCL 08G

Horizontal networks were adjusted in the simplest way in the height controlled spatial system without reducing observations to the ellipsoid. The mathematical model of the adjustment is based on the known principles of three dimensional geodesy. A computer program based on this method is described. GRA

N80-16433# Connecticut Univ., Storrs. Inst. of Water Resources.

DETERMINATION OF HYDROLOGIC PARAMETERS FOR GLACIAL TILLS IN CONNECTICUT M.S. Thesis

Lynn Joseph Torak 1979 172 p refs

(Contract DI-14-34-0001-9007)

(PB-300313/4; W79-09677; OWRT-A-077-CONN(1)) Avail: NTIS HC A08/MF A01 CSCL 08H

Glacial tills located in the upland areas of the Shetucket and Quinebaug River basins, Connecticut, were evaluated for horizontal permeability using field and laboratory techniques. Laboratory determined vertical permeabilities were compared to horizontal permeabilities derived from both laboratory and dugwell tests. Results indicate that the till exhibits anisotrophic flow characteristics similar to most stratified sediments. Horizontal components of permeability of at least an order of magnitude greater than vertical components are shown to exist for the glacial tills in this area. The hydrologic implications that arise from considering the anisotropy of the tills in this study area may have regional applications to similar tills located throughout New England. GRA

N80-16434# Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.

A MATHEMATICAL MODEL OF STRATIFIED, BIDIRECTIONAL FLOW IN SHORT CULVERTS M.S. Thesis
Delbert G. Martin 1979 89 p refs
(Contract DI-14-34-0001-7191)
(PB-300494/2; W79-09835; OWRT-B-139-UTAH(5)) Avail: NTIS HC A05/MF A01 CSCL 08H

A two dimensional computer model, simulating bidirectional, density-stratified gravity flow in the vertical plane was developed. The finite element method was applied to the governing equations, i.e., the equations of motion, continuity and convection-diffusion, to obtain a well-posed boundary value problem. Bidirectional flow is known to exist in the culverts located in the railroad causeway of the Great Salt Lake. The discharges, densities, temperatures, interface location, and head differences across the causeway were measured on a monthly basis, from October 1968 to September 1972. This data was used to verify the mathematical model. GRA

N80-16435# Purdue Univ., Lafayette, Ind. Water Resources Research Center.
HEURISTIC DECISION RULES FOR WATER RESOURCES PLANNING
V. Akileswaran, Thomas L. Morin, and Wilbur L. Meier, Jr. Aug. 1979 274 p refs
(Contract DI-14-34-0001-7118)
(PB-300578/2; TR-119; W79-09962; OWRT-B-086-Ind(1)) Avail: NTIS HC A12/MF A01 CSCL 08H

Many of the analytical techniques proposed for water resources planning are simply too sophisticated to be of practical use. Thus, there exists a huge gap between the 'seat-of-the-pants' or ad hoc procedures which are currently in use and the more sophisticated techniques which are not. This situation is a result of a number of factors which are addressed. It is shown how this gap can be successfully filled in many situations through the use of heuristic solution procedures. The heuristics are so simple to apply that they have been successfully implemented on programmable hand-held calculators. GRA

N80-16436# Utah Water Research Lab., Logan.
A MATHEMATICAL HYDRODYNAMIC CIRCULATION MODEL OF GREAT SALT LAKE FOR RESOURCE MANAGEMENT Final Report
Gary Z. Watters and Charles T. Kincaid Jun. 1979 82 p refs
(Contract DI-14-34-0001-7191)
(PB-299013/3; W79-09054; OWRT-B-139-Utah(6)) Avail: NTIS HC A05/MF A01 CSCL 08H

A hydrodynamic circulation model for Great Salt Lake was developed along with several supporting mathematical models required to provide information on boundary conditions and mixing processes. Two of the supporting models were developed to describe bidirectional seepage flow and culvert flow through the railroad causeway which divides the lake into a north and south arm. A third model utilizes the velocity field computed by the circulation model and provides information on convective and dispersive processes in the lake. A laboratory study was directed toward establishing the diffuse transfer of material from the lower layer of the south arm to the upper layer. GRA

N80-16437# Geological Survey, Tallahassee, Fla. Water Resources Div.
EVALUATION OF A DIGITAL MODEL FOR ESTUARINE WATER QUALITY SIMULATION IN WASTE ALLOCATION STUDIES
G. E. Seaburn, M. E. Jennings, and M. L. Merritt Apr. 1979 57 p refs Prepared in cooperation with Fla. State Dept. of Environmental Regulation, Tallahassee
(PB-298820/2; USGS/WRD/WRI-79/028) Avail: NTIS HC A04/MF A01 CSCL 08H

Four estuaries along the west coast of peninsular Florida were chosen to make an evaluation of an estuarine model application. Consitituents simulated were dissolved oxygen, carbonaceous biochemical oxygen demand, total Kjeldahl nitrogen, and chloride. Current and predicted waste loading of the four estuaries is also described. The model was developed for well-mixed, steady-state, intertidal conditions. Thus, simulated concentrations of substances are computed as average values over a tide cycle. The general equations for the model are based on the law of conservation of mass. GRA

N80-16438# Geological Survey, Champaign, Ill. Water Resources Div.
EFFECTS OF URBANIZATION ON THE MAGNITUDE AND FREQUENCY OF FLOODS IN NORTHEASTERN ILLINOIS Final Water-Data Report
Howard E. Allen, Jr. and Richard M. Bejcek May 1979 56 p refs Prepared in cooperation with Illinois State Dept. of Transportation, Chicago
(PB-299065/3; USGS/WRD/WRI-79/031) Avail: NTIS HC A04/MF A01 CSCL 08H

Changes in land use associated with urbanization increased flood-peak discharges in northeastern Illinois by factors ranging up to 3.2. Techniques are presented for estimating the magnitude and frequency of floods in that area and for estimating probable changes in flood characteristics that may be expected to accompany progressive urbanization. Three variables, drainage area, channel slope, and percent imperviousness (an urbanization factor), are used to estimate flood magnitudes for frequencies ranging from 2 to 500 years. Multiple-regression analyses were used to relate flood-discharge data to the above watershed characteristics for 103 gaged watersheds. These watersheds ranged in drainage area from 0.07 to 630 square miles, in channel slope from 1.1 to 115 feet per mile, and in imperviousness from 1 to 39 percent. GRA

N80-16439# Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
AQUIFER MODELING BY NUMERICAL METHODS APPLIED TO AN ARIZONA GROUNDWATER BASIN
Graham E. Fogg, Eugene S. Simpson, and Shlomo P. Neuman Jun. 1979 152 p refs
(Contract DI-14-34-0001-6235)
(PB-298962/2; TR-32; W79-09052; OWRT-C-7517(6235)(1)) Avail: NTIS HC A08/MF A01 CSCL 08H

A mixed explicit-implicit finite element program, called FLUMP was calibrated against a data base obtained from a portion of the Tucson Basin aquifer, Arizona. Previous models for the same region were constructed (an electric analog and a finite difference model) in which calibration was based on prescribed flux boundary conditions along stream courses and mountain fronts. These fluxes are not directly measured and estimates are subject to large uncertainties. In contrast, boundary conditions used in the calibration of FLUMP were prescribed hydraulic heads obtained from direct measurement. GRA

N80-16440# National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Environmental Research Lab.
SOLAR ALTITUDE EFFECTS ON ICE ALBEDO
S. J. Bolsenga Jun. 1979 52 p refs
(PB-301252/3; NOAA-TM-ERL-GLERL-25; GLERL-Contrib-149; NOAA-79081605) Avail: NTIS HC A04/MF A01 CSCL 08L

The albedos of many natural surfaces, such as soils and crops, are known to be affected by solar altitude, but similar processes have not been well documented for ice surfaces. A limited set of ice albedo data shown that the effects of solar altitude are not nearly as pronounced as those attributed to many other natural surfaces. Surface geometry, direct-diffuse radiation balance, and spectral balance all contribute to these differences. GRA

N80-16441# Montana Bureau of Mines and Geology, Butte.
STRIP COAL MINING AND MINED-LAND RECLAMATION IN THE HYDROLOGIC SYSTEM, SOUTHEASTERN MONTANA
Wayne A. VanVoast, Robert B. Hedges, and John J. McDermott Dec. 1978 129 p refs Prepared in cooperation with Montana Coll. of Mineral Science and Technology, Butte
(Contract OWRC-10570165)
(PB-301253/1; OWRC-70) Avail: NTIS HC A07/MF A01 CSCL 08I

Coal beds which are locally important aquifers for southeastern Montana's agricultural economy are being removed as mining development occurs. Overburden rock materials (spoils) replace the coal beds as aquifers. As mine pits are backfilled, ground waters readily reenter the spoils. The chemistry of spoils waters is diverse, reflecting the lithologic and geochemical variability of overburden materials. At Decker, predominant ions in spoils water

are sodium and bicarbonate; at Colstrip, they are magnesium, calcium, and sulfate. Statistically, spoils waters in both areas are more highly mineralized than nearby stock and domestic waters. Column backing experiments conducted with spoils produced leachates that were chemically similar to waters found in the field. First pore volumes of the leachate were also chemically similar to saturated-paste extracts. The relationships between saturated-paste-extracts quality and spoils-water quality were utilized to develop generalized nomographs for predicting spoils-water cation concentrations from pre-mining paste-extract chemistry. Similar attempts toward predictive nomographs utilizing specific conductance were unsuccessful. GRA

N80-16442# American Univ., Washington, D. C.
APPLICATION OF PLATE TECTONICS TO THE LOCATION OF NEW MINERAL TARGETS IN THE APPALACHIANS Progress Report
Jan Kutina 20 Apr. 1979 68 p refs
(Grant NSF AER-76-81807)
(PB-300512/1; NSF/RA-790143; PR-3) Avail: NTIS HC A04/MF A01 CSCL 08I

Analyses which suggest that the basement of the Central and Eastern U.S. consists of large crustal blocks separated by major zones of tectonic weakness are reviewed. The regularities in the distribution of ore deposits in the Appalachians are discussed. Comments on the segmentation of the Appalachian orogeny by transverse lineaments are presented. The report contains seventeen maps of the eastern half of the U.S. showing specific mineral deposits in relation to geologic formations. GRA

N80-16443# Bureau of Mines, Pittsburgh, Pa. Mining and Safety Research Center.
SIDEBOARD DEVICE FOR IMPROVED FACE VENTILATION IN COAL MINES Technical Progress Report, period ending Aug. 1979
Edward F. Drivers, John C. LaScola, and Fred N. Kissel Aug. 1979 15 p
(PB-300365/4; BM-TPR-108) Avail: NTIS HC A02/MF A01 CSCL 08I

A sideboard device designed to act as an extension of conventional brattice, thus improving face ventilation of developing room and pillar type coal mining was tested. In these laboratory tests, an 8 foot long rigid sideboard was mounted vertically along the left fender of a full scale model ripper-type continuous mining machine, rising to the mine roof to provide an air seal. It extended from the auger support frame pivot point outby along the fender. A novel water spray manifold was used to form an air seal between the sideboard and brattice. Tests showed improvement in face ventilation with the prototype device, and also demonstrated that water sprays can form an effective air seal over a fairly wide pressure range. GRA

N80-16444# Bureau of Mines, Pittsburgh, Pa. Mining and Safety Research Center.
RADIANT HEATING OF MINE BULKHEADS
John C. Edwards 1979 22 p refs
(PB-300363/9; BM-RI-8356) Avail: NTIS HC A02/MF A01 CSCL 08I

A time dependent mathematical model of radiative heating of bulkheads in mines was developed. The model includes both reradiation from the duct (cylindrical) walls and direct radiation from the fire zone. Thermal loss into the wall of the duct and into the bulkhead is included. Both brick and wood bulkheads are considered. It was found that the heating rate of the system scales as the duct length-to-diameter ratio and the flame temperature. In particular, the time required for the irradiated surface of the bulkhead to reach a specified temperature decreases with increasing flame temperature for a fixed length-to-diameter ratio and increases with increasing length-to-diameter ratio for a specified flame temperature. GRA

N80-16445# GCA Corp., Bedford, Mass. Technology Div.
IMPROVED LIGHT SCATTERING DUST MONITOR Final Report, 3 Aug. 1977 - 31 May 1978
Pedro Lilienfeld 28 Feb. 1979 48 p refs
(Contract DI-BM-HO-377092)
(PB-299938/1; BM-OFR-90-79) Avail: NTIS HC A03/MF A01 CSCL 08I

The development, design, fabrication, and testing of a portable, battery-operated, light scattering monitor for the rapid measurement of the concentration of respirable dust in mining environments are described. This instrument incorporates state-of-the-art design characteristics and makes use of advanced solid-state components both for light emission as well as for its detection. The use of a pulsed light source combined with synchronous signal detection minimizes drift problems and optimizes the sensitivity of the measurement. Equivalent mass concentration measurements as low as 10 micrograms per cubic meter can be routinely performed with time constants of about 2 seconds. GRA

N80-16446# Geological Survey, Raleigh, N. C. Water Resources Div.
A TECHNIQUE FOR ESTIMATING HEIGHTS REACHED BY THE 100-YEAR FLOOD ON UNREGULATED, NONTIDAL STREAMS IN NORTH CAROLINA Final Report, 1978 - 1979
R. W. Coble Jul. 1979 21 p refs
(PB-301372/9; USGS/WRI-79/69) Avail: NTIS HC A02/MF A01 CSCL 08H

A method for estimating heights reached by floods having a recurrence interval of 100 years is defined for nontidal streams with unregulated flows in North Carolina. The flood heights are the vertical distance between stream stage at median discharge (50 percent duration) and the 100-year flood stage and are defined for streams draining areas between 1 and 10,000 square miles. A flood height drainage area relation was determined by regression analysis for each of the three physiographic areas of the State-mountains, piedmont, and coastal plain. An illustrated example of how the method can be used in conjunction with topographic maps to estimate flood heights and delineate inundated areas by interpolation is given. GRA

N80-16447# Geological Survey, Tallahassee, Fla. Water Resources Div.
HYDROLOGIC DATA FROM URBAN WATERSHEDS IN THE TAMPA BAY REGION
M. A. Lopez and D. M. Michaelis Aug. 1979 60 p
(PB-301204/4; USGS/WRI-78/125;
USGS/WRD/WRI-79/066) Avail: NTIS HC A04/MF A01 CSCL 08H

Hydrologic data were collected in 10 urbanized watersheds located in the Tampa Bay area, Florida. The gaged watersheds have impervious areas that range from 19 percent for a residential watershed in north Tampa to nearly 100 percent for a downtown Tampa watershed. Land use type, including roads, residential, commercial, industrial, institutional, recreational, and open space, were determined for each watershed. Rainfall and storm runoff data collected were processed. These data were recorded at 5 minute intervals. Chemical and biological analyses of storm runoff for six sites, base flow for seven sites, and analyses of bottom material for seven sites were also stored in the WATSTORE water quality file. GRA

N80-16448# Geological Survey, Menlo Park, Calif. Water Resources Div.
APPLICATION OF TRANSIENT-FLOW TO THE SACRAMENTO RIVER AT SACRAMENTO, CALIFORNIA Final Report
Richard N. Oltmann Feb. 1979 29 p refs Prepared in cooperation with California State Dept. of Water Resources, Sacramento
(PB-301103/8; USGS/WRD/WRI-79/063;
USGS/WRI-78/119) Avail: NTIS HC A03/MF A01 CSCL 08H

The transient-flow simulation model was applied to the Sacramento River at Sacramento, California. An alternative is needed to the empirical stage-fall-discharge computational method, which provides only daily mean discharges and required frequent measurement over a 25- to 26-hour period of the tide-affected flow. Measurement of tide-affect flow involves use of a cable suspended across the river; this presents a hazardous navigational condition. Use of the model does not eliminate the hazardous navigational problem, but it significantly reduces the time that this condition exists. The model demonstrates that it can provide reliable daily mean as well as instantaneous discharge

data. The model also has the capability of providing discharge data for locations farther downstream in the tidal zone from the Sacramento stream gage; this is not possible with the stage-fall-discharge computational method. GRA

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N80-16449* National Aeronautics and Space Administration, Washington, D. C.
ENERGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES. ISSUE 23
Oct. 1979 882 p
(NASA-SP-7043(23)) Avail: NTIS HC E07 CSCL 10B

This bibliography lists 1786 reports, articles, and other documents introduced into the NASA scientific and technical information system from July 1, 1979 through September 30, 1979. Author

N80-16450# General Electric Co., Philadelphia, Pa. Applied Sciences Lab.
SIMULATION OF MHD AND STEAM CYCLE FACILITY
Daniel Stern 7 Feb. 1980 90 p
(Dec-80SDS006) Avail: General Electric Company, Space and Research Division, P.O. Box 8555, Philadelphia, Pa. HC $25.00

An existing nonlinear simulation of magnetohydrodynamic (MHD) facility was modified and installed on a PDP 11/34 computer. Time response plots were generated from the nonlinear simulation. A linearized MHD simulation was generated from the nonlinear simulation. A comparison was made between root locus plots and time response plots. The report includes FORTRAN listings of the linear and nonlinear simulations. R.E.S.

N80-16451 Rutgers - The State Univ., New Brunswick, N. J.
THE INTERFACE STATE EFFECTS AND CHARACTERIZATION OF MIS SOLAR CELLS Ph.D. Thesis
Jimm Koo Kim 1979 201 p
Avail: Univ. Microfilms Order No. 7928412

Sets of samples were prepared and experiments were performed on MIS diodes to investigate the interface state density distributions across the semiconductor band gap, using various substrates and metals. The current flow mechanisms in tunneling MIS solar cells were studied. A computer algorithm, generated to simulate the photovoltaic action of MIS solar cells based on the theory developed is described. Experimental data such as the interface state density spectra, time constants, absorption cross sections, and oxide capacitance used in generating I-V plots in dark and under light conditions are discussed. The boundary value problem solved by the computer iterative method using Shickley's assumption of constant quasi Fermi level throughout the depletion region, is described. Dissert. Abstr.

N80-16452* National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.
ALUMINIUM OR COPPER SUBSTRATE PANEL FOR SELECTIVE ABSORPTION OF SOLAR ENERGY Patent
Marion L. Roberts, Max H. Sharpe, and Albert C. Krupnick, inventors (to NASA) Issued 4 Dec. 1979 6 p Filed 30 May 1978 Supersedes N78-25557 (16 - 16, p 2137) Division of US Patent Appl. SN-829390, Filed 31 Aug. 1977, US Patent 4,104,134
(NASA-Case-MFS-23518-3; US-Patent-4,177,325; US-Patent-Appl-SN-910793; US-Patent-Class-428-629; US-Patent-Class-428-650; US-Patent-Class-428-658; US-Patent-Class-428-675; US-Patent-Class-428-680; US-Patent-Class-126-417; US-Patent-Class-126-901; US-Patent-Appl-SN-829390; US-Patent-4,104,134) Avail: US Patent and Trademark Office CSCL 10A

A method for making panels which selectively absorb solar energy is disclosed. The panels are comprised of an aluminum substrate, a layer of zinc thereon, a layer of nickel over the zinc layer and an outer layer of solar energy absorbing nickel oxide or a copper substrate with a layer of nickel thereon and a layer of solar energy absorbing nickel oxide distal from the copper substrate.

Official Gazette of the U.S. Patent and Trademark Office

N80-16453*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.
LARGE WIND-TURBINE DESIGN CHARACTERISTICS AND R AND D REQUIREMENTS
Seymour Lieblein, ed. (Technical Report Services, Rocky River, Ohio) Dec. 1979 459 p refs Conf. held at Cleveland, 24-26 Apr. 1979; sponsored in part by DOE
(NASA-CP-2106; CONF-7904111) Avail: NTIS HC A20/MF A01 CSCL 10B

Detailed technical presentations on large wind turbine research and development activities sponsored by public and private organizations are presented. Both horizontal and vertical axis machines are considered with emphasis on their structural design. For individual titles, see N80-16454 through N80-16482.

N80-16454*# Department of Energy, Washington, D. C.
OVERVIEW OF FEDERAL WIND ENERGY PROGRAM
Daniel F. Ancona In NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 1-24 ref (For primary document see N80-16453 07-44)
Avail: NTIS HC A20/MF A01 CSCL 10B

The objectives and strategies of the Federal wind energy program are described. Changes in the program structure and some of the additions to the program are included. Upcoming organizational changes and some budget items are discussed, with particular emphasis on recent significant events regarding new approvals. R.E.S.

N80-16455*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.
DESIGN EVOLUTION OF LARGE WIND TURBINE GENERATORS
David A. Spera *In its* Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 25-33 ref (For primary document see N80-16453 07-44)
Avail: NTIS HC A20/MF A01 CSCL 10B

During the past five years, the goals of economy and reliability have led to a significant evolution in the basic design--both external and internal--of large wind turbine systems. To show the scope and nature of recent changes in wind turbine designs, development of three types are described: (1) system configuration developments; (2) computer code developments; and (3) blade technology developments. R.E.S.

N80-16456*# General Electric Co., Philadelphia, Pa. Space Div.
THE GENERAL ELECTRIC MOD-1 WIND TURBINE GENERATOR PROGRAM
Richard H. Poor and R. B. Hobbs In NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 35-59 (For primary document see N80-16453 07-44)
Avail: NTIS HC A20/MF A01 CSCL 10B

The design, fabrication, installation and checkout of MOD-1, a megawatt class wind turbine generator which generates utility grade electrical power, is described. A MOD-1/MOD-1A tradeoff study is discussed. R.E.S.

N80-16457*# Boeing Engineering and Construction, Seattle, Wash.
THE BOEING MOD-2 WIND TUNNEL SYSTEM RATED AT 2.5 MW
Richard R. Douglas *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 61-78 (For primary document see N80-16453 07-44)

Avail: NTIS HC A20/MF A01 CSCL 10B

A summary description of MOD-2 development and the resulting system hardware is presented. R.E.S.

N80-16458*# WTG Energy Systems, Inc., Buffalo, N.Y.

WTG ENERGY SYSTEMS' MP1-200 200 KILOWATT WIND TURBINE GENERATOR

Allen P. Spaulding, Jr. *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 79-88 (For primary document see N80-16453 07-44)

Avail: NTIS HC A20/MF A01 CSCL 10B

The preliminary design criteria of the MP1-200 wind turbine are given along with a brief description of the wind turbine generator. Performance and operational experience and cost factors are included. Recommendations for additional research are listed. J.M.S.

N80-16459*# National Swedish Board for Energy Source Development, Spanga.

SPECIFICATION, SITING AND SELECTION OF LARGE WECS PROTOTYPES

Sven Hugosson *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 89-102 (For primary document see N80-16453 07-44)

Avail: NTIS HC A20/MF A01 CSCL 10B

The development of large-scale windpowered systems is outlined. Topics discussed include: prototype specifications development, site selection process, and selection of prototype contractor. J.M.S.

N80-16460*# Technical Univ. of Denmark, Lyngby.

THE DANISH LARGE WIND TURBINE PROGRAM

B. Maribo Pederson *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 103-120 (For primary document see N80-16453 07-44)

Avail: NTIS HC A20/MF A01 CSCL 10B

A brief description of the Danish wind energy program and its present status is given. Results and experiences from tests on the Gedser windmill (200 kW) are presented. The key results are presented from the preliminary design study and detailed design of two new WECS (630 kW each) is described. J.M.S.

N80-16461*# Maschinenfabrik Augsburg-Nuernberg A.G., Augsburg (West Germany).

LARGE WIND ENERGY CONVERTER: GROWIAN 3 MW

F. Koerber and Hans A. Thiele *In* NASA Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 121-132 (For primary document see N80-16453 07-44)

Avail: NTIS HC A20/MF A01 CSCL 10B

The main features of the Growian wind energy converter are presented. Energy yield, environmental impact, and construction of the energy converter are discussed. Reliability of the windpowered system is assessed. J.M.S.

N80-16462*# Sandia Labs., Albuquerque, N. Mex.

CHARACTERISTICS OF FUTURE VERTICAL AXIS WIND TURBINES (VAWTs)

Emil G. Kadlec *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 133-141 refs (For primary document see N80-16453 07-44)

(Contract DE-AC04-76DP-00789)

Avail: NTIS HC A20/MF A01 CSCL 10B

The developing Darrieus VAWT technology whose ultimate objective is economically feasible, industry-produced, commercially marketed wind energy systems is reviewed. First-level aerodynamic, structural, and system analyses capabilities which support and evaluate the system designs are discussed. The characteristics of current technology designs are presented and their cost effectiveness is assessed. Potential improvements identified are also presented along with their cost benefits. J.M.S.

N80-16463*# National Research Council of Canada, Ottawa (Ontario).

DESIGN CHARACTERISTICS OF THE 224 kW MAGDALEN ISLANDS VAWT

R. J. Templin *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 143-154 refs (For primary document see N80-16453 07-44)

Avail: NTIS HC A20/MF A01 CSCL 10A

The evolution of the main design features of the Magdalen Islands vertical axis wind turbine (VAWT) is described. The turbine has a rotor height of 120 ft (36.58 m) and diameter 80 ft (24.38 m). It was operated as a joint project between NRC and Hydro-Quebec in grid-coupled mode from July 1977 to July 1978 when the rotor was destroyed in an accident. The accident, although unfortunate, tested the basic integrity of the design in a gross overspeed condition, and the rotor is being rebuilt with minor modifications. Some directions for future VAWT research are suggested. M.M.M.

N80-16464*# Aluminum Co. of America, Alcoa Center, Pa.

ALCOA WIND TURBINES

Daniel K. Ai *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 155-171 refs (For primary document see N80-16453 07-44)

Avail: NTIS HC A20/MF A01 CSCL 10A

An overview of Alcoa's wind energy program is given with emphasis on the the development of a low cost, reliable Darrieus Vertical Axis Wind Turbine System. The design layouts and drawings for fabrication are now complete, while fabrication and installation to utilize the design are expected to begin shortly. M.M.M.

N80-16465*# Sandia Labs., Albuquerque, N. Mex.

TEST RESULTS OF THE DOE/SANDIA 17 METER VAWT

Robert O. Nellums and M. H. Worstell *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 173-184 refs (For primary document see N80-16453 07-44)

(Contract DE-AC04-76-DP00789)

Avail: NTIS HC A20/MF A01 CSCL 10B

A review is given of the test program of a 17 meter Vertical Axis Wind Turbine VAWT. Performance test results are discussed including difficulties encountered during the VAWT operation along with ways of solving these problems. M.M.M.

N80-16466*# Sandia Labs., Albuquerque, N. Mex.

OVERVIEW OF VERTICAL AXIS WIND TURBINE (VAWT)

William N. Sullivan *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics R and D Requirements Dec. 1979 p 185-192 refs (For primary document see N80-16453 07-44)

(Contract DE-AC04-76-DP00789)

Avail: NTIS HC A20/MF A01 CSCL 10B

A survey is presented of the practices which were applied for designing VAWT blades. An attempt is made to discuss strengths and weaknesses of the existing procedures. Discussion is provided on planned or suggested future work in developing improved design tools. M.M.M.

N80-16467*# Aluminum Co. of America, Alcoa Center, Pa. Technical Marketing Div.

FABRICATION OF EXTRUDED VERTICAL AXIS TURBINE BLADES

Arthur G. Craig, Jr. *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 193-204 refs (For primary document see N80-16453 07-44)

Avail: NTIS HC A20/MF A01 CSCL 10B

Important characteristics of the extruded aluminum blade for the Vertical Axis Wind Turbine are presented. Their weight, structural strength, shape, and maintainability are pointed out. M.M.M.

N80-16468*# Sandia Labs., Albuquerque, N. Mex.

OPERATIONAL EXPERIENCE WITH VAWT BLADES

William N. Sullivan *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 205-210 ref (For primary document see N80-16453 07-44)

(Contract DE-AC04-76-DP00789)

Avail: NTIS HC A20/MF A01 CSCL 10B

The structural performance of 17 meter diameter wind turbine rotors is discussed. Test results for typical steady and vibratory

stress measurements are summarized along with predicted values of stress based on a quasi-static finite element model. K.L.

N80-16469*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STRUCTURAL ANALYSIS CONSIDERATIONS FOR WIND TURBINE BLADES
David A. Spera *In its* Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 211-224 refs (For primary document see N80-16453 07-44)
Avail: NTIS HC A20/MF A01 CSCL 10B

Approaches to the structural analysis of wind turbine blade designs are reviewed. Specifications and materials data are discussed along with the analysis of vibrations, loads, stresses, and failure modes. K.L.

N80-16470*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
BLADE DESIGN AND OPERATING EXPERIENCE ON THE MOD-0A 200 kW WIND TURBINE AT CLAYTON, NEW MEXICO
Bradford S. Linscott and Richard K. Shaltens *In its* Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 225-238 refs (For primary document see N80-16453 07-44)
Avail: NTIS HC A20/MF A01 CSCL 10B

Two 60 foot long aluminum wind turbine blades were operated for over 3000 hours on the MOD-0A wind turbine. The first signs of blade structural damage were observed after 400 hours of operation. Details of the blade design, loads, cost, structural damage, and repair are discussed. K.L.

N80-16471*# Lockheed Aircraft Service, Inc., Ontario, Calif.
EVALUATION OF AN OPERATING MOD-0A 200 kW WIND TURBINE BLADE
Robert E. Donham *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 239-265 refs (For primary document see N80-16453 07-44)
Avail: NTIS HC A20/MF A01 CSCL 10B

Operating loads and structural damage were monitored during operation of the MOD-0A electric generating system. The turbine was damaged locally between stations 48 and 125 after 2.8 million rotations. Loads due to degraded yaw stiffness and fretting at rib station 48 were identified as primary to this distress. The repaired blades operated an additional 4.8 million rotations without problems. K.L.

N80-16472*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DESIGN, FABRICATION, AND TEST OF A STEEL SPAR WIND TURBINE BLADE
Timothy L. Sullivan, Paul J. Sirocky, Jr., and Larry A. Viterna *In its* Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 267-284 refs (For primary document see N80-16453 07-44)
Avail: NTIS HC A20/MF A01 CSCL 10B

The design and fabrication of wind turbine blades based on 60 foot steel spars are discussed. Performance and blade load information is given and compared to analytical prediction. In addition, performance is compared to that of the original MOD-0 aluminum blades. Costs for building the two blades are given, and a projection is made for the cost in mass production. Design improvements to reduce weight and improve fatigue life are suggested. K.L.

N80-16473*# WTG Energy Systems, Inc., Buffalo, N.Y.
WTG ENERGY SYSTEMS' ROTOR: STEEL AT 80 FEET
Robert E. Barrows *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 285-292 (For primary document see N80-16453 07-44)
Avail: NTIS HC A20/MF A01 CSCL 10B

The design, specifications, and performance of the 80 foot diameter fixed pitch rotor operating on the MP1-200 wind turbine generator installed as part of the Island of Cuttyhunk's electric power utility grid system are described. This synchronous generating system rated 200 kilowatts at 28 mph wind velocity, and produces constant 60 Hz, 480 VAC current at +/- 1 percent accuracy throughout the machine's operating range. Future R & D requirements and suggestions are included with cost data. A.R.H.

N80-16474*# Gougeon Bros., Inc., Bay City, Mich.
THE USE OF WOOD FOR WIND TURBINE BLADE CONSTRUCTION
Meade Gougeon and Mike Zuteck *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 293-308 (For primary document see N80-16453 07-44)
Avail: NTIS HC A20/MF A01 CSCL 10B

The interrelationships between moisture and wood, conditions for dry rot spore activity, the protection of wood fibers from moisture, wood resin composites, wood laminating, quality control, and the mechanical properties of wood are discussed. The laminated veneer and the bonded sawn stock fabrication techniques, used in the construction of a turbine blade with a monocoque 'D' section forming the leading edge and a built up trailing edge section, are described. A 20 foot root end sample complete with 24 bonded-in studs was successfully subjected to large onetime loads in both the flatwise and edgewise directions, and to fatigue tests. Results indicate that wood is both a viable and advantageous material for use in wind turbine blades. The basic material is reasonably priced, domestically available, ecologically sound, and easily fabricated with low energy consumption. A.R.H.

N80-16475*# Kaman Aerospace Corp., Bloomfield, Conn.
LARGE, LOW COST COMPOSITE WIND TURBINE BLADES
Herbert W. Gewehr *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 309-324 refs (For primary document see N80-16453 07-44)
Avail: NTIS HC A20/MF A01 CSCL 10B

A woven roving E-glass tape, having all of its structural fibers oriented across the tape width was used in the manufacture of the spar for a wind turbine blade. Tests of a 150 ft composite blade show that the transverse filament tape is capable of meeting structural design requirements for wind turbine blades. Composite blades can be designed for interchangeability with steel blades in the MOD-1 wind generator system. The design, analysis, fabrication, and testing of the 150 ft blade are discussed. A.R.H.

N80-16476*# Boeing Engineering and Construction, Seattle, Wash.
THE MOD-1 STEEL BLADE
John VanBronkhorst *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 325-342 (For primary document see N80-16453 07-44)
Avail: NTIS HC A20/MF A01 CSCL 10B

The design, development, fabrication, testing, and transport of two 100 foot metal blades for the MOD-1 WTS are summarized. Because the metal blade design was started late in the MOD-1 system development, many of the design requirements (allocations) were restrictive for the metal blade concept, particularly the maximum weight requirement. The design solutions required to achieve the weight goal resulted in a labor intensive (expensive) fabrication, particularly for a quantity of only two blades manufactured using minimal tooling. A.R.H.

N80-16477*# Boeing Engineering and Construction, Seattle, Wash.
THE BOEING MOD-2 WIND TURBINE SYSTEM ROTOR
Gordon N. Davison *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 343-354 (For primary document see N80-16453 07-44)
Avail: NTIS HC A20/MF A01 CSCL 10B

External configuration, environmental, and internal design requirements for the 300 foot diameter MOD-2 rotor are discussed, with emphasis on design details, significance of fatigue strength, design development test results, and conclusions of the preliminary design efforts. A.R.H.

N80-16478*# Southern California Edison Co., Rosemead.
STATUS OF THE SOUTHERN CALIFORNIA EDISON COMPANY 3 MW WIND TURBINE GENERATOR (WTG)

DEMONSTRATION PROJECT

Robert L. Scheffler *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 355-362 (For primary document see N80-16453 07-44)
Avail: NTIS HC A20/MF A01 CSCL 10B

To demonstrate the concept of utility scale electricity production from a high wind energy resource, a program was initiated to construct and test a 3 megawatt (3,000 kW) Schachle wind turbine generator near Palm Springs, California. The background and current status of this program are presented along with a summary of future planned program activities.
A.R.H.

N80-16479*# Institut de Recherche de l'Hydro-Quebec, Varennes (Canada).

RESULTS OF A UTILITY SURVEY OF THE STATUS OF LARGE WIND TURBINE DEVELOPMENT

A. Watts, S. Quraeshi (Shawinigan Eng. Co. Ltd., Montreal), and L. P. Rowley (Canadair Ltd., Montreal) *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 363-374 (For primary document see N80-16453 07-44)
Avail: NTIS HC A20/MF A01 CSCL 10B

Wind energy conversion systems were surveyed from a utility viewpoint to establish the state of the art with regard to: (1) availability of the type of machines; (2) quality of power generation; (3) suitability for electrical grid; (4) reliability; and (5) economics. Of the 23 designs discussed, 7 have vertical axis wind turbines, 9 have upwind horizontal axis turbines, and 7 have downwind horizontal axis turbines.
A.R.H.

N80-16480*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

SIMULATION STUDIES OF MULTIPLE LARGE WIND TURBINE GENERATORS ON A UTILITY NETWORK

Leonard J. Gilbert and David M. Triezenberg (Purdue Univ.) *In* its Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 375-384 refs (For primary document see N80-16453 07-44)
Avail: NTIS HC A20/MF A01 CSCL 10B

The potential electrical problems that may be inherent in the inertia of clusters of wind turbine generators and an electric utility network were investigated. Preliminary and limited results of an analog simulation of two MOD-2 wind generators tied to an infinite bus indicate little interaction between the generators and between the generators and the bus. The system demonstrated transient stability for the conditions considered.
A.R.H.

N80-16481*# Hamilton Standard, Windsor Locks, Conn.

SYSTEM CONFIGURATION IMPROVEMENT

Glidden S. Doman *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 385-396 (For primary document see N80-16453 07-44)
Avail: NTIS HC A20/MF A01 CSCL 10B

Factors involved in the choice of the system configuration for the wind turbine generator are listed. It was found that choices among the many configuration options can be based strictly upon the resulting cost of energy results. Choices made on that basis also lead to reduced analytical complexity, less hardware complexity and reduced program risk. It was also found that many seemingly minor details turn out to have important impacts that are seen only after design, performance and cost-finding were thoroughly probed.
M.M.M.

N80-16482*# Hamilton Standard, Windsor Locks, Conn.

COST OF ENERGY EVALUATION

Thad M. Hasbrouck *In* NASA. Lewis Res. Center Large Wind Turbine Design Characteristics and R and D Requirements Dec. 1979 p 397-402 (For primary document see N80-16453 07-44)
Avail: NTIS HC A20/MF A01 CSCL 10B

The estimated cost per kilowatt hour, the wind resources in the utilities service area, and the reliability of the units are considered in computing the cost of energy of the wind turbine generator system.
M.M.M.

N80-16483*# Energy Technology, Inc., Cleveland, Ohio.

STUDY OF ADVANCED RADIAL OUTFLOW TURBINE FOR SOLAR STEAM RANKINE ENGINES

Cecil Martin and Terry Kolenc Dec. 1979 74 p refs
(Contract DEN3-86)
(NASA-CR-159695; DOE/NASA/0086-79/1; ETI-1279) Avail: NTIS HC A04/MF A01 CSCL 10B

The performance characteristics of various steam Rankine engine configurations for solar electric power generation were investigated. A radial outflow steam turbine was investigated to determine: (1) a method for predicting performance from experimental data; (2) the flexibility of a single design with regard to power output and pressure ratio; and (3) the effect of varying the number of turbine stages. All turbine designs were restricted to be compatible with commercially available gearboxes and generators. A study of several operating methods and control schemes for the steam Rankine engine shows that from an efficiency and control simplicity standpoint, the best approach is to hold turbine inlet temperature constant, vary turbine inlet pressure to match load, and allow condenser temperature to float maintaining constant heat rejection load.
A.R.H.

N80-16484*# National Aeronautics and Space Administration, Washington, D. C.

SATELLITE POWER SYSTEM (SPS)

Henry G. Edler Oct. 1978 20 p refs
(Contract EG-77-C-02-4042)
(NASA-TM-80943; TID-29094) Avail: NTIS HC A02/MF A01 CSCL 10A

Potential organizational options for a solar power satellite system (SPS) were investigated. Selection and evaluation criteria were determined to include timeliness, reliability, and adequacy to contribute meaningfully to the U.S. supply; political feasibility (both national and international); and cost effectiveness (including environmental and other external costs). Based on these criteria, four organizational alternatives appeared to offer reasonable promise as potential options for SPS. A large number of key issues emerged as being factors which would influence the final selection process. Among these issues were a variety having to do with international law, international institutions, environmental controls, economics, operational flexibility, congressional policies, commercial-vs-governmental ownership, national dedication, and national and operational stategic issues.
R.E.S.

N80-16485*# General Electric Co., Philadelphia, Pa. Space Div.

PROTOTYPE SOLAR HEATING AND COMBINED HEATING COOLING SYSTEMS

DOE 2 Oct. 1978 44 p Sponsored in part by DOE
(Contract NAS8-32092)
(NASA-CR-161340; GR-9) Avail: NTIS HC A03/MF A01 CSCL 10A

The design and development of eight prototype solar heating and combined heating and cooling systems is discussed. The program management and systems engineering are reported, and operational test sites are identified.
A.W.H.

N80-16486*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

CHARACTERIZATION OF SOLAR CELLS FOR SPACE APPLICATIONS. VOLUME 11: ELECTRICAL CHARACTERISTICS OF 2 ohm-cm, 228 MICRON WRAPAROUND SOLAR CELLS AS A FUNCTION OF INTENSITY, TEMPERATURE, AND IRRADIATION

B. E. Anspaugh, D. M. Beckert, R. G. Downing, and R. S. Weiss 15 Jan. 1980 45 p
(Contract NAS7-100)
(NASA-CR-162686; JPL-Pub-78-15-Vol-11) Avail: NTIS HC A03/MF A01 CSCL 10A

Parametric characterization data on Spectrolab 2 by 4 cm, 2 ohm/cm, 228 micron thick wraparound cell, a candidate for the Solar Electric Propulsion Mission, are presented. These data consist of the electrical characteristics of the solar cell under a wide range of temperature and illumination intensity combinations of the type encountered in space applications.
J.M.S.

N80-16487*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

EVALUATION OF CONCENTRATED SPACE SOLAR ARRAYS USING COMPUTER MODELING

D. E. Rockey 1 Nov. 1979 54 p refs

(Contract NAS7-100)
(NASA-CR-162681; JPL-PUB-79-87) Avail: NTIS HC A04/MF A01 CSCL 10A

A general approach is developed for predicting the power output of a concentrator enhanced photovoltaic space array. A ray trace routine determines the concentrator intensity arriving at each solar cell. An iterative calculation determines the cell's operating temperature since cell temperature and cell efficiency are functions of one another. The end result of the iterative calculation is that the individual cell's power output is determined as a function of temperature and intensity. Circuit output is predicted by combining the individual cell outputs using the single diode model of a solar cell. Concentrated array characteristics such as uniformity of intensity and operating temperature at various points across the array are examined using computer modeling techniques. An illustrative example is given showing how the output of an array can be enhanced using solar concentration techniques. Author

N80-16488*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MANUFACTURING METHODS OF A COMPOSITE CELL CASE FOR A Ni-Cd BATTERY
J. L. Bauer 15 Dec. 1979 59 p refs
(Contract NAS7-100)
(NASA-CR-162724; JPL-PUB-79-101) Avail: NTIS HC A04/MF A01 CSCL 10A

Basic manufacturing method refinements for using graphite epoxy material for a nickel cadmium battery cell case were performed to demonstrate production feasibility. The various facets of production scale-up, i.e., process and tooling development, together with material and process control, were integrated into a comprehensive manufacturing process that assures production reproducibility and product uniformity. Test results substantiate that a battery cell case produced from graphite epoxy pre-impregnated material, utilizing the internal pressure bag fabrication method, is feasible. R.E.S.

N80-16489*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DIFFUSION LENGTH MEASUREMENTS OF THIN GaAs SOLAR CELLS BY MEANS OF ENERGETIC ELECTRONS
Oldwig vonRoss 1 Feb. 1980 17 p refs
(Contract NAS7-100)
(NASA-CR-162692; JPL-PUB-79-121) Avail: NTIS HC A02/MF A01 CSCL 10A

A calculation of the short circuit current density (j sub sc) of a thin GaAs solar cell induced by fast electrons is presented. It is shown that in spite of the disparity in thickness between the N-type portion of the junction and the P-type portion of the junction, the measurement of the bulk diffusion length L sub p of the N-type part of the junction is seriously hampered due to the presence of a sizable contribution to the j sub sc from the P-type region of the junction. Corrections of up to 50% had to be made in order to interpret the data correctly. Since these corrections were not amenable to direct measurements it is concluded that the electron beam method for the determination of the bulk minority carrier diffusion length, which works so well for Si solar cells, is a poor method when applied to thin GaAs cells. R.E.S.

N80-16490*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
POTENTIAL PERFORMANCE IMPROVEMENT USING A REACTING GAS (NITROGIN TETROXIDE) AS THE WORKING FLUID IN A CLOSED BRAYTON CYCLE Final Report
Robert J. Stochl Dec. 1979 23 p refs
(Contract EX-76-A-29-1060)
(NASA-TM-79322; DOE/NASA/1060-79/3) Avail: NTIS HC A02/MF A01 CSCL 10B

The results of an analysis to estimate the performance that could be obtained by using a chemically reacting gas (nitrogen tetroxide) as the working fluid in a closed Brayton cycle are presented. Compared with data for helium as the working fluid, these results indicate efficiency improvements from 4 to 90 percent, depending on turbine inlet temperature, pressures, and gas residence time in heat transfer equipment. Author

N80-16491*# Foster-Miller Associates, Inc., Waltham, Mass.
A 15kWe (NOMINAL) SOLAR THERMAL ELECTRIC POWER CONVERSION CONCEPT DEFINITION STUDY: STEAM RANKINE REHEAT RECIPROCATOR SYSTEM Final Report
H. Fuller, R. Demler, E. Poulin, and P. Dantowitz Jun. 1979 63 p refs
(Contracts DEN3-62; EX-76-A-29-1060)
(NASA-CR-159590; DOE/NASA/0062-79/1; NAS-7845) Avail: NTIS HC A04/MF A01 CSCL 10B

An evaluation was made of the potential of a steam Rankine reheat reciprocator engine to operate at high efficiency in a point-focusing distributed receiver solar thermal-electric power system. The scope of the study included the engine system and electric generator; not included was the solar collector/mirror or the steam generator/receiver. A parametric analysis of steam conditions was completed leading to the selection of 973 K 12.1 MPa as the steam temperature/pressure for a conceptual design. A conceptual design was completed for a two cylinder/opposed engine operating at 1800 rpm directly coupled to a commercially available induction generator. A unique part of the expander design is the use of carbon/graphite piston rings to eliminate the need for using oil as an upper cylinder lubricant. The evaluation included a system weight estimate of 230 kg at the mirror focal point with the condenser mounted separately on the ground. The estimated cost of the overall system is $1932 or $90/kW for the maximum 26 kW output. R.E.S.

N80-16492*# Wyle Labs., Inc., Huntsville, Ala.
OUTDOOR TEST FOR THERMAL PERFORMANCE EVALUATION OF THE OWENS-ILLINOIS SUNPACK SEC-801 (AIR) SOLAR COLLECTOR
Dec. 1979 28 p Sponsored in part by DOE Prepared for IBM Federal Systems Div., Huntsville, Ala.
(Contract NAS8-32036)
(NASA-CR-161339; WYLE-TR-531-37R) Avail: NTIS HC A03/MF A01 CSCL 10A

The test procedures used and the test results obtained during the performance of an evaluation test program on the Owens-Illinois Sunpak, model SEC-801, air solar collector under natural outdoor weather conditions are presented. All testing activities were performed on a single module. The test was performed and the data evaluated as applicable to outdoor testing of solar collectors. J.M.S.

N80-16493*# Sundstrand Corp., Rockford, Ill.
THE 15 kW SUB e (NOMINAL) SOLAR THERMAL ELECTRIC POWER CONVERSION CONCEPT DEFINITION STUDY: STEAM RANKINE TURBINE SYSTEM Final Report
Timothy J. Bland Oct. 1979 63 p refs
(Contracts DEN3-61; EX-76-A-29-1060)
(NASA-CR-159589; AER-1713; DOE/NASA/0061-79/1) Avail: NTIS HC A04/MF A01 CSCL 10A

A study to define the performance and cost characteristics of a solar powered, steam Rankine turbine system located at the focal point of a solar concentrator is presented. A two stage re-entry turbine with reheat between stages, which has an efficiency of 27% at a turbine inlet temperature of 732 C was used. System efficiency was defined as 60 Hertz electrical output divided by absorbed thermal input in the working fluid. Mass production costs were found to be approximately 364 dollars/KW. R.E.S.

N80-16494*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PRELIMINARY ANALYSIS OF PERFORMANCE AND LOADS DATA FROM THE 2-MEGAWATT MOD-1 WIND TURBINE GENERATOR
D. A. Spera, L. A. Viterna, T. R. Richards, and H. E. Neustadter 1979 16 p refs Presented at 4th Biennial Conf. and Workshop on Wind Energy Conversion Systems, Washington, D.C., 29-31 Oct. 1979; sponsored by DOE
(Contract EX-77-A-29-1010)
(NASA-TM-81408; DOE/NASA/1010-79/5; E-322) Avail: NTIS HC A02/MF A01 CSCL 10A

Preliminary test data on output power versus wind speed, rotor blade loads, system dynamic behavior, and start-stop characteristics on the Mod-1 wind turbine generator are presented.

These data were analyzed statistically and are compared with design predictions of system performance and loads. To date, the Mod-1 wind turbine generator has produced up to 1.5 MW of power, with a measured power versus wind speed curve which agrees closely with design. Blade loads were measured at wind speeds up to 14 m/s and also during rapid shutdowns. Peak transient loads during the most severe shutdowns are less than the design limit loads. On the inboard blade sections, fatigue loads are approximately equal to the design cyclic loads. On the outboard blade sections, however, measured cyclic loads are significantly larger than design values, but they do not appear to exceed fatigue allowable loads as yet. R.E.S.

N80-16495*# Jet Propulsion Lab., California Inst. of Tech., Pasadena. Semiconductor Group.
SEMICONDUCTOR GRADE, SOLAR SILICON PURIFICATION PROJECT Final Report
W. M. Ingle, R. R. Rosler, S. W. Thompson, and R. E. Chaney
10 Dec. 1979 173 p
(Contract JPL-954442)
(NASA-CR-162746; DOE/JPL-954442-78/12; Motorola-2257/12) Avail: NTIS HC A08/MF A01 CSCL 10A

Experimental apparatus and procedures used in the development of a 3-step SiF2(x) polymer transport purification process are described. Both S.S.M.S. and E.S. analysis demonstrated that major purification had occured and some samples were indistinguishable from semiconductor grade silicon (except possibly for phosphorus). Recent electrical analysis via crystal growth reveals that the product contains compensated phosphorus and boron. The low projected product cost and short energy payback time suggest that the economics of this process will result in a cost less than the goal of $10/Kg(1975 dollars). The process appears to be readily scalable to a major silicon purification facility. A.R.H.

N80-16496# Mobil Tyco Solar Energy Corp., Waltham, Mass.
AMORPHOUS SILICON THIN FILM HETEROJUNCTION SOLAR CELLS Quarterly Progress Report, 1 Apr. - 30 Jun. 1979
Aug. 1979 27 p refs
(Contract ET-78-C-03-1846)
(SAN-1846-T3; MT-79-3Q; QPR-3) Avail: NTIS HC A03/MF A01

Experiments on the substitution of carbon for silicon and the substitution of germanium for silicon in hydrogenated a-silicon films grown by capacitive glow discharge techniques are described. Measured optical and electrical properties of the various films are reported. An appendix on the calculation of optical constants (near the absorption edge) in amorphous films is included. DOE

N80-16497# University of Southeastern Massachusetts, North Dartmouth.
ECONOMICS OF GEOTHERMAL POWER
R. DiPippo Feb. 1979 13 p Transl. into ENGLISH from Nucl. Elec. Power Generation (Japan), v. 26, no. 9, Sep. 1975 p 1039-1043
(Contract EY-76-S-02-4051)
(COO-4051-43) Avail: NTIS HC A02/MF A01

Geothermal, steam, nuclear, and hydraulic construction costs, power generating costs, and utilization rate are compared. The risk factor in exploratory geothermal wells is discussed. DOE

N80-16498# Los Alamos Scientific Lab., N. Mex.
CHARACTERIZATION OF CRUSHED GLASS AS A TRANSPIRED AIR HEATING SOLAR COLLECTOR MATERIAL
R. K. Collier 1979 6 p refs Presented at the Intern. Solar Energy Soc. Meeting, Atlanta, 28 May 1979
(Contract W-7405-eng-36)
(LA-UR-79-1336; CONF-790541-7) Avail: NTIS HC A02/MF A01

The use of crushed glass matrices as the heat absorbing media in air heating solar collectors was investigated. The most likely candidate glass types and sizes were characterized by measuring pressure drops, optical extinction coefficients, and volumetric heat transfer coefficients. Bed efficiencies were also measured and found to be similar to those expected for screen matrices unless critical amounts of clear glass were used as a top layer, which results in lower efficiency. DOE

N80-16499# Technical Translation Service, Albuquerque, N. Mex.
USE OF SOLAR ENERGY FOR THE PRODUCTION OF ELECTRICITY IN THE ALPS
Jan. 1979 48 p Transl. into ENGLISH from Serie de Publications de la Commission Federale de la Conception Globale de l'Energie (Geneva), etude no. 7 Oct. 1976 48 p Prepared in cooperation with Battelle Memorial Inst., Geneva, Switzerland
(SAND-79-6000) Avail: NTIS HC A03/MF A01

Means of converting solar energy into electricity are reviewed. Applications of solar energy technology to meet the increasing demand for electricity in Switzerland are considered. A description and discussion of central tower and heliostat field systems is presented. Details concerning steam cycles and solar boilers, turboalternator units and heat exhaust systems, daily and seasonal power variations of a solar plant, and effects on energy output due to cloudiness are considered. Meteorological data for the evaluation of possible solar generating sites is discussed and the solar potential of the Alps is analyzed. Integration of solar plants into the existing power grid is discussed. The economic and environmental impacts of solar power plants are considered in detail and a development program is suggested. DOE

N80-16500# Department of Energy, Washington, D. C. Energy Information Administration.
SOLAR COLLECTOR MANUFACTURING ACTIVITY Energy Data Report, Jul. - Dec. 1978
Sep. 1979 45 p
(DOE/EIA-0174/78) Avail: NTIS HC A03/MF A01

Results from a survey of solar collector manufacturing and importing activity are presented. Manufacturers of medium temperature liquid collectors, used primarily for hot water and space heating, low temperature nonmetallic collectors used for pool heating, and special collectors (evacuated tube collector or a concentrating collector), used for pool heating and for air conditioning and specialized industrial processes are included. J.M.S.

N80-16501# Lincoln Lab., Mass. Inst. of Tech., Lexington.
FLYWHEEL ENERGY STORAGE AND CONVERSION SYSTEM FOR PHOTOVOLTAIC APPLICATIONS
A. R. Millner 1979 7 p refs Presented at the Mech. and Magnetic Energy Storage Conductor Ann. Rev., Washington, D.C., 19-22 Aug. 1979
(Contract EY-76-C-02-4094)
(COO-4094-57; CONF-790854-3) Avail: NTIS HC A02/MF A01

A project to develop a flywheel energy storage unit for use with photovoltiacs in residential or load center applications is described. The unit employs a high efficiency permanent-magnet motor-generator and cycloconverter electronics to convert dc input to regulated ac output. The fabrication of a scale model unit, scaling laws for residential and intermediate load center sizes, and worth and cost estimation are discussed. DOE

N80-16502# Brookhaven National Lab., Upton, N. Y.
DECENTRALIZED ENERGY: TECHNOLOGY ASSESSMENT AND SYSTEMS DESCRIPTION
M. K. Reckard Jun. 1979 206 p refs
(Contract EY-76-C-02-0016)
(BNL-50987) Avail: NTIS HC A10/MF A01

Decentralized energy systems and their characteristic features are examined. These systems are divided into six groups for the purpose of analysis: solar, wind, hydro, biomass, geothermal, and coproduction (total energy). The technical and economic potential for the implementation of these systems is discussed for the years 2000 and 2025. The results of a comparison of base-case and decentralized scenarios for the year 2000, using a computer systems model, are presented. Social and institutional factors are also addressed, both as motivations for and results of energy system decentralization. Appendices are included with more detailed technical information on each of the systems groups. DOE

N80-16503# Department of Energy, Washington, D. C.
ENVIRONMENTAL DEVELOPMENT PLAN: SOLAR THERMAL POWER SYSTEMS
Aug. 1979 45 p refs
(DOE/EDP-0035) Avail: NTIS HC A03/MF A01

The goals of the program and potential environmental, health, safety, and socioeconomic impacts relevant to solar thermal power systems (STPS), particularly those sited in the Southwest are discussed. These impacts are screened for key issues, i.e., those issues considered to be the most serious in nature, that have near-term importance to the program, and for which current knowledge of effects and control is inadequate. A management plan is then presented for conducting and coordinating environmental research in concert with the technology development effort to ensure that identified environmental issues are resolved prior to significant public deployment of the technology. Key environmental concerns associated with the development and deployment of STPS were identified in the following subject areas: (1) site selection (including the question of water availability); (2) ecological and microclimatic effects; (3) working fluid handling and release modes; and (4) misdirected solar radiation. DOE

N80-16504# National Climatic Center, Asheville, N. C.
INPUT DATA FOR SOLAR SYSTEMS
V. Cinquemani, J. R. Owenby, Jr., and R. G. Baldwin Aug. 1979 203 p refs
(Contract EX-76-A-29-1041)
(DOE/TIC-10193-Rev-1) Avail: NTIS HC A10/MF A01

Normals (30-year mean values) of maximum, minimum, and average temperatures for a month or year, and of heating and cooling degree days are provided for 248 U.S. stations. Average daily values of total hemispheric (global) solar radiation on a horizontal surface were based on corrected hourly measurements for 25 stations, derived values from corrected measurements for 25 stations, and derived values from the corrected measurements for the remaining 222 stations. DOE

N80-16505# Sandia Labs., Albuquerque, N. Mex.
WORKSHOP ON POWER CONDITIONING FOR ALTERNATIVE ENERGY TECHNOLOGIES, EXECUTIVE SUMMARY
D. R. Smith 1979 139 p Workshop held at Denver, 9-11 May 1979
(Contracts EY-76-C-04-0789; EG-77-C-01-4042)
(SERI-TP-35-217-Pt-2) Avail: NTIS HC A07/MF A01

The development of power conditioners for alternative energy technologies is presented. Topics discussed include: (1) assessments of current technology; (2) identification of operational requirements with a comparison of requirements for each source technology; (3) the identification of future technology trends; (4) the determination of mass production and marketing requirements; and (5) recommendstions for program direction. DOE

N80-16506# Oak Ridge National Lab., Tenn.
FOSSIL ENERGY PROGRAM Quarterly Progress Report, period ending 30 Sep. 1978
L. E. McNeese Jan. 1979 287 p refs
(Contract W-7405-eng-26)
(ORNL-5487) Avail: NTIS HC A13/MF A01

Research and development projects that are carried out in support of the increased utilization of coal and other fossil fuel alternatives to oil and gas as sources of clean energy are reviewed. These projects include: coal conversion techniques, coal gasification processes, fossil energy environmental studies, materials technology development for coal conversion, and a life sciences synthetic fuel program for biological research of health hazards in coal conversion. DOE

N80-16507# Brookhaven National Lab., Upton, N. Y.
COMPUTER SIMULATION OF GROUND COUPLED STORAGE IN A SERIES SOLAR ASSISTED HEAT PUMP SYSTEM
J. W. Andrews and Philip D. Metz 1979 5 p refs Presented at the 1979 Intern. Solar Energy Soc. Congr., Atlanta, 28 May - 1 Jun. 1979
(Contract EY-76-C-02-0016)
(BNL-26216; CONF-790541-25) Avail: NTIS HC A02/MF A01

The effect of thermal coupling between the ground and the heat storage element of a series solar assisted heat pump system is studied quantitatively. The transient simulation computer program TRNSYS is used to simulate the solar portion of this system. A program to simulate the thermal interaction of the storage element with the ground is incorporated into TRNSYS as a subroutine. This program calculates heat flow through the ground in discrete steps over space and time. Boundary conditions are established. The ground coupled storage is driven by thermal inputs from the solar portion of the system and from the changing ambient and ground temperatures. DOE

N80-16508# General Atomic Co., San Diego, Calif.
FIXED MIRROR SOLAR CONCENTRATOR FOR APPLICATION TO A 100 MW(e) ELECTRIC GENERATING PLANT
J. R. Schuster, J. M. Neill, and J. Bass May 1979 6 p refs Presented at the 14th Intersoc. Energy Conf., Boston, 5-10 Aug. 1979
(Contract ET-78-C-03-2240)
(GA-A-15340; CONF-790803-10) Avail: NTIS HC A02/MF A01

A design study was performed of a 100 MW(e) power plant that uses a fixed mirror solar concentrator (FMSC) to supply energy for steam generation. Various heat transport fluids were considered and draw salt was selected over Therminol 88 and sodium. The complete plant was modeled in a cost performance optimization code which automatically performed tradeoffs such as reduced blocking vs increased piping costs, field piping heat loss vs pumping power, and fluid outlet temperature vs overall system efficiency. Various collector and receiver designs were studied and evaluated for their cost effectiveness. Operational requirements impacting the component designs were identified. DOE

N80-16509# Brookhaven National Lab., Upton, N. Y.
EXPERIMENTAL RESULTS FROM THE SOLAR GROUND COUPLING RESEARCH FACILITY AT BROOKHAVEN NATIONAL LABORATORY
P. D. Metz 1979 5 p refs Presented at the Intern. Solar Energy Soc. Meeting, Atlanta, 28 May - 1 Jun. 1979
(Contract EY-76-C-02-0016)
(BNL-26219; CONF-790541-27) Avail: NTIS HC A02/MF A01

The results of the first half year of operation of the solar ground coupling research facility are presented. The data from the eight original experiments are analyzed. A computer model of the heat transfer between first generation ground coupled heat transfer and storage devices for a solar source heat pump system and the Earth is discussed. DOE

N80-16510# Massachusetts Inst. of Tech., Cambridge.
INDEPENDENT ASSESSMENT OF ENERGY POLICY MODELS Final Report
E. Kuh and D. O. Wood May 1979 273 p refs Sponsored by EPRI
(EPRI Proj. 1015-1)
(EPRI-EA-1071) Avail: NTIS HC A12/MF A01

Energy policy models are reviewed and analyzed. Two energy system models, the Baughman-Joskow regionalized electricity model and the Wharton annual energy model are assessed and the organizational and procedural issues in the model assessment process are identified. DOE

N80-16511# Midwest Research Inst., Golden, Colo.
SOIL FERTILITY AND SOIL LOSS CONSTRAINTS ON CROP RESIDUE REMOVAL FOR ENERGY PRODUCTION
S. Flaim Jul. 1979 38 p refs
(Contract EG-77-C-01-4042)
(SERI/RR-52-324) Avail: NTIS HC A03/MF A01

A summary of the methodologies used to estimate the soil fertility and soil loss constraints on crop residue removal for energy production is presented. Estimates of excess residue are developed for wheat in north central Oklahoma and for corn and soybeans in central Iowa. The sample farming situations are analyzed. DOE

N80-16512# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOLAR PHOTOVOLTAIC FIELD TESTS AND APPLICATIONS PROJECT Quarterly Technical Report, 1 Apr. - 30 Jun. 1978
1978 58 p refs
(Contract EY-76-C-02-4094)
(COO-4094-26) Avail: NTIS HC A04/MF A01

Field tests for a variety of both large and small experimental photovoltaic systems are summarized. Support activities in the areas of power conditioning, control, and storage; materials, processes, testing, and data acquisition are reviewed. DOE

N80-16513# Midwest Research Inst., Golden, Colo.
OBJECTIVES AND STRATEGIES OF THE INTERNATIONAL PHOTOVOLTAIC PROGRAM PLAN
D. Costello, D. Posner, R. Koontz, P. Heiferling, P. Carpenter (JPL), and L. Perelman (JPL) Jul. 1979 45 p refs
(Contract EG-77-C-01-4042)
(SERI/TR-52-250) Avail: NTIS HC A03/MF A01

The objective of the International Photovoltaic Program Plan, the strategies that will be used in the plan, and the approach that is being taken to prepare the plan are described. Background on photovoltaic technology and markets and the DOE domestic photovoltaic effort is also presented. DOE

N80-16514# Midwest Research Inst., Golden, Colo.
PROCEEDINGS: PHOTOVOLTAICS USER REVIEW PANEL
S. Carroll Aug. 1979 26 p refs Proc. held at Golden, Colo., 6-7 Mar. 1979
(Contract EG-77-C-01-4042)
(SERI/TP-69-276) Avail: NTIS HC A03/MF A01

The discussions, recommendations, and conclusions of the photovoltaics user review panel are presented. The purpose of the panel discussion was to determine the technical information dissemination (TID) needs for target audiences, to reach agreement on what informational products could fill these needs and who should produce the materials, and to establish priorities for the need for the TID products. Technological areas discussed include photovoltaics, solar thermal power, biomass, wind energy conversion, and ocean thermal energy conversion. DOE

N80-16515# Kaiser Aluminum and Chemical Corp., Pleasanton, Calif.
ENERGY SAVINGS THROUGH USE OF AN IMPROVED REDUCTION CELL CATHODE
W. H. Goodnow 1979 19 p refs
(Contract EC-76-C-03-1257)
(SAN-1257-T2) Avail: NTIS HC A02/MF A01

Material characterization for a wettable and rained Hall cell cathode was expanded to include inspection of TiB2 components for the 15KA cell restart. The cell was restarted and went through a shakedown and performance monitoring period. An engineering and economic study of TiB2 retrofit into existing cells was carried to the point where a sensitivity type cost analysis was done. DOE

N80-16516# Sandia Labs., Albuquerque, N. Mex. Thermal and Fluid Sciences Dept.
COMPARATIVE ANALYSIS OF SOLAR ENERGY STORAGE CYCLES
C. E. Hackett 1979 25 p refs Presented at the Intern. Conf. on Solar Energy, Milan, 23 Sep. 1979
(SAND-79-1803C; CONF-790954-1) Avail: NTIS HC A02/MF A01

A thermodynamic technique is presented which will enable the assessment of the overall performance of various storage options on an absolute basis so that cost effective designs can be developed to obtain the full thermodynamic and system advantages of energy storage. First the underlying thermodynamic principles of entropy production analysis are examined. The various energy storage schemes are classified. Detailed analyses were developed to cover the various generic types of energy storage which are appropriate for solar power systems. DOE

N80-16517# Sandia Labs., Albuquerque, N. Mex.
PREPARATION OF THIN FILMS FOR SOLAR ENERGY UTILIZATION
D. M. Mattox 1979 17 p refs Presented at the National Vacuum Symp., New York, N.Y., 2 Oct. 1979
(Contract EY-76-C-04-0789)
(SAND-79-1754C; CONF-791013-2) Avail: NTIS HC A02/MF A01

A technology assessment of thin film deposition techniques is presented. Commercial applications of thin films include photothermal selective absorbers formed by electroplating, chemical conversion and vacuum processing; solar reflectors formed by vacuum processes; heat reflectors formed by vacuum processes and spray pyrolysis; antireflection coatings formed by vacuum processes and chemical leaching and the metallization of photovoltaic cells. CdS/Cu2S photovoltaics formed by vacuum processes and spray pyrolysis are also close to commercial utilization. Principle concerns in thin films applications include economics of fabrication and environmental stability of the thin film materials. One of the major problems with thin film evaluation is the lack of acceptable testing procedures particularly as related to lifetime. The status of thin films in solar energy utilization is reviewed. DOE

N80-16518# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
EXPERIMENTAL TEST FACILITY FOR SELECTIVE RADIATIVE COOLING SURFACES
F. Sakkal, M. Martin, and P. Berdahl Aug. 1979 6 p refs Presented at the Nat. Passive Solar Energy Conf., Kansas City, Kansas, 3 Oct. 1979
(Contract W-7405-eng-48)
(LBL-9697; CONF-791022-92) Avail: NTIS HC A02/MF A01

The newly constructed radiator test facility at Lawrence Berkeley Laboratory is described and preliminary results are presented for cooling rates from two radiating surfaces. DOE

N80-16519# Ames Lab., Iowa.
PRELIMINARY EXPERIMENTAL RESULTS ON THE OPTICAL PROPERTIES OF MODEL DIRECT SOLAR GAIN INTERIORS
J. F. McClelland, R. Fuchs, R. N. Knisseley, D. A. Block, and L. Hodges 1979 5 p refs Presented at the Nat. Passive Solar Energy Conf., Kansas City, Kansas, 3 Oct. 1979 Prepared jointly with Iowa St. Univ. of Science and Technology, Ames
(Contract W-7405-eng-82)
(ISM-233) Avail: NTIS HC A02/MF A01

An assessment is presented of conditions necessary for quantitative characterizations of direct solar gain optical properties using photoacoustic measurements. Means of satisfying the experimental requirements are discussed in detail. DOE

N80-16520# Idaho National Engineering Lab., Idaho Falls.
COMMERCIAL PROTOTYPE DESIGN OF A SOLAR HEATING/COOLING SYSTEM FOR A MANUFACTURED HOME
M. P. Scofield (EG&G Idaho, Inc., Idaho Falls), A. S. Lau (EG&G Idaho, Inc., Idaho Falls), K. H. Liebelt (EG&G Idaho, Inc., Idaho Falls), N. R. Shinn (Boise Cascade Corp., Idaho), and T. L. Schafer (Boise Cascade Corp., Idaho) Sep. 1979 140 p refs Prepared jointly with Boise Cascade Corp., Idaho
(Contract EY-76-C-07-1570)
(TREE-1384) Avail: NTIS HC A07/MF A01

A prototype design is presented for a solar heating and cooling system for a manufactured modular home. The objective was to develop an active solar system for space heating that would be competitive with conventional energy sources; that is, the increase in the mortgage payment would be completely and simultaneously recovered from energy savings. The heating and cooling system features air collectors that are structurally part of the south facing rear wall, rock storage that is in the basement, and a heat exchanger that preheats domestic hot water. Summer cooling is achieved by cooling rock storage at night and circulating house air through the storage during the day as required. Two nearly identical homes were designed and built incorporating the prototype system. Both in Idaho, one house is located in Boise, the other in Idaho Falls, placing the homes in distinctly different climates. Both homes are being monitored for a two-year period to obtain dynamics and long-term performance data. The results of the monitoring will be the subjects of further reports. DOE

N80-16521# Solar Environmental Engineering Co., Inc., Fort Collins, Colo.
CONTINUING REGIONAL SOLAR ENERGY INFORMATION MINI-CENTER ACTIVITIES AND UPDATING THE SOLCOST PROGRAM Quarterly Report
L. J. Lantz Jul. 1979 69 p
(Contract EG-77-C-02-4643)
(COO-4643-T2) Avail: NTIS HC A04/MF A01

Progress in the various tasks in the program to develop SOLCOST is reviewed. Several SOLCOST examples are included. DOE

N80-16522# Institute of Gas Technology, Chicago, Ill.
SOLAR-MEC DEVELOPMENT PROGRAM, PROJECT 9103 Semiannual Progress Report, 1 Sep. 1977 - 28 Feb. 1978
J. Wurm, S. A. Weil, and L. R. Wright Jan. 1979 44 p
(Contract EG-77-C-02-4495)
(COO-4495-7) Avail: NTIS HC A03/MF A01

The dynamic performance of a supported molecular-sieve, regenerative, heat and mass exchanger is reported, under input conditions typical of the operation of a solar-power open desiccant cooling system. The experimental data are compared with a computer model describing the dynamic processes of air drying and desiccant regeneration of the Solar-MEC desiccant cooling system. The test setup, the experimental program, and the results of diagnostic steps to evaluate and minimize air leakage rates within the Solar-MEC system are described. The test design and experimental approach to verify the performance of the rotary regenerative (sensible) heat exchanger are reported. DOE

N80-16523# Argonne National Lab., Ill. Components Technology Div.
OTEC PERFORMANCE TESTS OF THE UNION CARBIDE ENHANCED-TUBE CONDENSER
David T. Yung, David L. Hillis, James J. Lorenz, and Norman F. Sather May 1979 33 p refs
(Contract W-31-109-eng-38)
(ANL/OTEC-PS-2) Avail: NTIS HC A03/MF A01

Results of performance tests conducted on a Union Carbide enhanced-tube condenser with wire wrapping on the ammonia side and internal axial fins on the water side are reported. This unit performed satisfactorily and was free of operational difficulties. At design operating conditions (a heat duty of 3.2 million Btu/h, an inlet water temperature of 40 F, and a water flow rate of 3200 gpm) the steady-state value of the overall heat transfer coefficient was found to be 818 Btu/h sq + ft F, and the ammonia-side and water-side heat transfer coefficients were 5180 and 1130 Btu/h.sq ft F, respectively. The water-side pressure drop was 1.8 psi. Varying the heat duty from 2.4 million to 4.0 million Btu/h had a negligible effect on thermal performance. The value obtained for the ammonia-side-heat transfer coefficient at nominal conditions is about two times that predicted by the Nusselt expression for condensation on a smooth tube. The water-side coefficient is within 3% of the value predicted by the Noranda correlation for finned tubes. DOE

N80-16524# Sandia Labs., Albuquerque, N. Mex.
SOLAR CENTRAL TEST FACILITY
G. E. Brandvold and John T. Holmes 1979 18 p Presented at the Frontiers of Power Generation Conf., Stillwater, Okla., 24 Sep. 1979
(Contract EY-76-C-04-0789)
(SAND-79-1730C; CONF-790924-1) Avail: NTIS HC A02/MF A01

The central receiver test facility capable of delivering 5 million watts of thermal power to experimental equipment is described. The primary CRTF testing programs which involve prototype components (receivers and heliostats) for central receiver solar electric power plants are discussed and the high solar flux and high temperature research and development work is reported. DOE

N80-16525# Department of Energy, Washington, D. C.
FEDERAL PHOTOVOLTAICS UTILIZATION PROGRAM
Jun. 1979 40 p refs
(DOE/EA-0087) Avail: NTIS HC A03/MF A01

The potential environmental effects of silicon cell technology are analyzed. It is noted that any potential environmental impacts of this technology occur in connection with manufacturing of silicon cells and proposed applications of photovoltaic systems. However, it was found that there are no known adverse environmental effects associated with the federal photovoltaics utilization program which cannot be mitigated or avoided. DOE

N80-16526# Massachusetts Inst. of Tech., Cambridge.
PHOTOCHEMICAL ENERGY STORAGE, STUDIES OF INORGANIC PHOTOASSISTANCE AGENTS Progress Report, 1 Apr. 1978 - 31 Mar. 1979
Mark S. Wrighton Dec. 1978 17 p refs
(Contract EY-76-S-02-4178)
(COO-4178-2) Avail: NTIS HC A02/MF A01

Photosensitive surfaces derivatized with redox active ferrocene-centered molecules were investigated. Surfaces studied include Au, Pt, Ge, Si, and GaAs using three different derivatizing reagents. In all cases, persistently-attached, electroactive material can be bound to the surface and characterized by cyclic voltammetry. It is shown that derivatized n-type Si can be used as a photoanode in aqueous electrolytes under conditions where the naked surface is passivated by photoinduced oxide growth (Si yields SiO/sub x/) too fast to allow any useful measurements. DOE

N80-16527# Boston Univ., Mass. Dept. of Chemistry.
ORGANIC PHOTOCHEMICAL STORAGE OF SOLAR ENERGY Progress Report, 1 Mar. 1978 - 31 Jan. 1979
G. Jones, II Feb. 1979 24 p refs
(Contract EG-77-S-02-4380)
(COO-4380-2) Avail: NTIS HC A02/MF A01

Photosensitization mechanisms for driving energy storing reactions of readily available organic compounds were studied. Aromatic sensitizers were used as complexing agents for a series of non-conjugated dienes which are capable of valence isomerization. Diene exciplexes, shown to be stabilized by electron donor-acceptor interaction, led to photoisomers with chemical and quantum efficiency in two of the cases studied. With triplet photosensitizers visible light (to 520 nm) was used to bring about an energy storing valence isomerization of a diester derivative of norbornadiene. High quantum yields (0.6) were measured at the longest wavelengths yet utilized for this type of isomerization. The quantum efficiency for isomerization using a very low energy triplet sensitizer was significantly enhanced at slightly elevated temperatures, suggesting that thermal energy (in amounts present in solar collector media) can be an aid in driving energy storing photo-reactions. DOE

N80-16528# Sandia Labs., Albuquerque, N. Mex.
MIDTEMPERATURE SOLAR SYSTEMS TEST FACILITY EXPERIMENT MANUAL AND TEST PLAN
Aug. 1979 52 p refs
(Contract EY-76-C-04-0789)
(SAND-79-0379) Avail: NTIS HC A04/MF A01

The midtemperature solar systems test facility is described and the procedures for selecting items to be evaluated there are outlined. The prerequisites for installing such items are defined, the typical tests performed are described, and the reports generated and disseminated from the facility are discussed. DOE

N80-16529# Midwest Research Inst., Golden, Colo.
PERFORMANCE CHARACTERISTICS OF A COMMERCIALLY AVAILABLE POINT-FOCUS SOLAR POWER
M. Bohn Apr. 1979 12 p refs Presented at the ASME/AICHE Natl. Heat Transfer Conf., San Diego, Calif., Aug. 1979
(Contract EG-76-C-01-4042)
(SERI/TP-34-169; CONF-790808-17) Avail: NTIS HC A02/MF A01

The performance of a commercially available solar electric power system is described in terms of instantaneous electrical power output for a given insolation and electrical energy production per day. Receiver thermal loss coefficient and concentrator optical efficiency are measured and system performance is given using steam cycle efficiency and electrical generator efficiency as parameters. DOE

N80-16530# Sandia Labs., Albuquerque, N. Mex.
MODELING THE BEAM CHARACTERIZATION SYSTEM
F. Biggs, C. N. Vittitoe, and D. L. King 1979 20 p refs

Presented at ISA Natl. Conf., Chicago, 22 Oct. 1979
(Contract EY-76-C-04-0789)
(SAND-79-1295C; CONF-791005-4) Avail: NTIS HC A02/MF A01

A theoretical model of the beam characterization system (BCS) to interpret results is presented. This model serves as an aid to define specifications, analyze measurements, calculate performance, and answer other questions about the heliostat. A statistical method is used to handle stochastic variables such as sun-tracking errors and surface-slope errors. A cone-optics technique is used to incorporate the statistics into a consistent model of the optical behavior of a heliostat. Use of the model to unfold slope-error distributions and sun-tracking statistics is described for measurements both in and out of the focal plane. The importance of auxiliary input information such as the sunshape (angular distribution of sun rays) to the analysis of BCS measurements is discussed. The role of the BCS in validating heliostats against acceptance criteria is summarized. DOE

N80-16531# Sandia Labs., Albuquerque, N. Mex.
HELIOSTAT BEAM CHARACTERIZATION SYSTEM-CALIBRATION TECHNIQUE
G. S. Phipps 1979 23 p refs Presented at the ISA Natl. Conf., Chicago, 22 Oct. 1979
(Contract EY-76-C-04-0789)
(SAND-79-1532C; CONF-791005-2) Avail: NTIS HC A02/MF A01

The beam characterization system which digitizes the output signal from a standard 525 line video camera to obtain raw data for measurements of solar heliostat images is described. Absolute irradiance values are obtained from a calibrated pyrheliometer included on the target screen. A video camera measures the relative irradiance values of areas of identical spectral composition. Measurements are made over a two dimensional spatial array of N screen locations. Calibration corrections are applied to the data from the N locations to obtain a single calibrated irradiance data matrix. Methods of obtaining these corrections are discussed and measured results are presented to support the various assumptions. DOE

N80-16532# Argonne National Lab., Ill. Energy and Environmental Systems Div.
SOLAR AVAILABILITY FOR WINTER SPACE HEATING: AN ANALYSIS OF THE CALENDAR PERIOD 1953-1975
J. G. Asbury, C. Maslowski, and R. O. Mueller Apr. 1979 20 p refs
(Contract W-31-109-eng-38)
(ANL/SPG-14) Avail: NTIS HC A02/MF A01

Data tapes for eight US sites containing hourly readings of insolation and ambient temperature for the period 1953-1975 were analyzed. Scatter-diagrams of insolation versus heating degree-days, compiled on a daily basis, indicate a wide variation in insolation levels, even during periods of coldest weather. For seven of the eight sites, the peak-day backup energy required by a solar space heating system exceeded 85 percent of the peak-day energy requirement of a conventional (nonsolar) heating system. The cities considered are Albuquerque (NM), Bismark (ND), Boston (MA), Caribou (ME), Columbia (MO), Madison (WI), Seattle (WA), and Sterling (VA). DOE

N80-16533# Westinghouse Electric Corp., Pittsburgh, Pa. Research and Development Center.
EMERGING MATERIAL SYSTEMS FOR SOLAR CELL APPLICATIONS
W. J. Biter and J. R. Szedon 8 Aug. 1979 23 p
(Contract DE-AC04-79ET-23003)
(DOE/ET-23003/1) Avail: NTIS HC A02/MF A01

Modifications and additions to the vacuum system in order to produce films of InP by the plasma-induced deposition process are described. DOE

N80-16534# Delaware Univ., Newark.
CARRIER TRANSPORT THROUGH HETEROJUNCTION SOLAR CELLS
K. W. Boeer 1979 7 p refs Presented at the Photovoltaic Solar Energy Conf., West Berlin, 23 Apr. 1979 Prepared jointly with SES, Inc., Newark, Del.
(Contract EX-76-C-23-1030)
(DOE/ET/23103-5; CONF-790457-8) Avail: NTIS HC A02/MF A01

Carrier transport through heterojunctions was analyzed and found to be influenced by the interconnection between the bands of the two semiconductors, by space charge effects near this interconnection, and by interface recombination. Estimation of the discontinuity of the conduction bands using the difference in electron affinities was found insufficient. The space charge double layer caused by charged dangling bonds along the dislocation network and its compensation via charged defects is discussed. Band profile for CdS/Cu2S and Cd/sub x/Zn/sub 1-x/S/Cu2S heterojunctions were evaluated quantitatively and agree within the experimental error with the observation, that, with decreasing lattice mismatch, the open circuit voltge increases, while the short circuit current decreases. DOE

N80-16535# Delaware Univ., Newark.
PHOTOVOLTAIC EFFECT, ITS PRESENT UNDERSTANDING AND REMAINING MYSTERIES
K. W. Boeer 1979 5 p refs Presented at the Intern. Solar Energy Society Meeting, Atlanta, 28 May 1979 Prepared jointly by SES, Inc., Newark, Del.
(Contract EX-76-C-23-1030)
(DOE/ET/23103-6; CONF-790541-44) Avail: NTIS HC A02/MF A01

The present phenomenological understanding of the photovoltaic effect and solar cells is discussed. Unexplained questions and problems with the effects of various device parameters on the current-voltage characteristics are discussed, and the need for more sophisticated theoretical analyses of photovoltaic cells is stressed. DOE

N80-16536# Department of Energy, Oak Ridge, Tenn. Technical Information Center.
COMPUTER MODELLING OF AMORPHOUS MATERIALS FOR PHOTOVOLTAIC CONVERSION Quarterly Progress Report
16 Apr. 1979 11 p refs
(Contract W-31-109-eng-38)
(DOE/TIC-10165; QPR-2) Avail: NTIS HC A02/MF A01

Various aspects of electron localization in models of amorphous silicon are reported. Observed fluctuations in charge neutrality as large as 0.5e have implications for the electrical conductivity of a-Si as well as its vibration frequencies and infrared absorption coefficient. Also, when defects in a-Si are introduced, it is found that the localization parameter reaches remarkably high values for a few states at the Fermi level. DOE

N80-16537# Motorola, Inc., Phoenix, Ariz. Semiconductor Group.
LOW-COST STRUCTURES FOR PHOTOVOLTAIC ARRAYS Final Report
P. Masser Aug. 1979 204 p refs
(Contract EY-76-C-04-0789)
(SAND-79-7006) Avail: NTIS HC A10/MF A01

Designs of photovoltaic array support structures, which encourage life cycle cost reduction through mass production techniques, material cost reduction, and simplified installation methods, are presented. Nontracking collectors with a low concentration ratio (one to about two sums) are considered primarily for commercial and utility applications. The results are applicable to both thermal and photovoltaic flat plate collectors. A value analysis approach was used, starting with a survey of the current state-of-the-art which found an absence of pertinent references on array support structures. Also, realistic load criteria were not found, and this was determined to be a key area for future cost reduction. Heights above the ground, array geometry, and wind direction all have important effects on loads. Foundation design was also found to be a key area for future cost reduction. A generic concept study was conducted, aimed at life cycle cost reduction, and representative examples were chosen. DOE

N80-16538# Midwest Research Inst., Golden, Colo.
PHOTOVOLTAIC MATERIALS AND DEVICE MEASUREMENTS WORKSHOP: FOCUS ON POLYCRYSTALLINE THIN FILM CELLS
1979 190 p refs Workshop, held at Arlington, Va., 11 Jun. 1979

(Contract EG-77-C-01-4042)
(SERI/TP-49-185; CONF-790801) Avail: NTIS HC A09/MF A01

Papers on the development of thin film solar cells by improving the versatility and reliability of material and device measurement techniques are presented. Structural/chemical aspects, electro-optics, and charge transport techniques are emphasized. DOE

N80-16539# Sandia Labs., Albuquerque, N. Mex.
ECONOMIC ANALYSIS OF DARRIEUS VERTICAL AXIS WIND TURBINE SYSTEMS FOR THE GENERATION OF UTILITY GRID ELECTRICAL POWER. VOLUME 1: EXECUTIVE SUMMARY
W. N. Sullivan Aug. 1979 28 p 4 Vol.
(Contract EY-76-C-04-0789)
(SAND-78-0962-Vol-1) Avail: NTIS HC A03/MF A01

The economic analysis of the Darrieus vertical axis wind turbine is discussed. A description of the technical approach used, key results, and major conclusions is presented along with a summary of the study. DOE

N80-16540# Sandia Labs., Albuquerque, N. Mex.
ECONOMIC ANALYSIS OF DARRIEUS VERTICAL AXIS WIND TURBINE SYSTEMS FOR THE GENERATION OF UTILITY GRID ELECTRICAL POWER. VOLUME 2: ECONOMIC OPTIMIZATION MODEL
W. N. Sullivan Aug. 1979 100 p refs 4 Vol.
(Contract EY-76-C-04-0789)
(SAND-78-0962-Vol-2) Avail: NTIS HC A05/MF A01

An economic study of the Darrieus vertical axis wind turbine (VAWT) economics is reported. A computer model of VAWT cost and performance factors useful for system design and optimization is presented. The content and limitations of the model are outlined. Output data are presented to demonstrate selection of optima and to indicate sensitivity of energy cost to design parameter variations. Optimized specifications generated by this model for six point designs are summarized. An appendix is included with a FORTRAN IV listing of the model and a description of the input/output characteristics. DOE

N80-16541# Sandia Labs., Albuquerque, N. Mex.
ECONOMIC ANALYSIS OF DARRIEUS VERTICAL AXIS WIND TURBINE SYSTEMS FOR THE GENERATION OF UTILITY GRID ELECTRICAL POWER. VOLUME 3: POINT DESIGNS
R. D. Grover and E. G. Kadlec Aug. 1979 99 p refs 4 Vol.
(Contract EY-76-C-04-0789)
(SAND-78-0962-Vol-3) Avail: NTIS HC A05/MF A01

Features of the Darrieus vertical axis wind turbine design including the blades, the speed increaser, guy cables and cable anchors, transmission, clutch, brakes, and the electrical system are discussed. System weight characteristics are tabulated. The operation and maintenance costs, and requirements reported and detailed descriptions of point designs for 120, 200, 500, and 1600 kW Darrieus vertical axis wind energy system are examined. DOE

N80-16542# Sandia Labs., Albuquerque, N. Mex.
ECONOMIC ANALYSIS OF DARRIEUS AXIS WIND TURBINE SYSTEMS FOR THE GENERATION OF UTILITY GRID ELECTRICAL POWER. VOLUME 4: SUMMARY AND ANALYSIS OF THE A. T. KEARNEY AND ALCOA LABORATORIES POINT DESIGN ECONOMIC STUDIES
W. N. Sullivan Aug. 1979 250 p refs 4 Vol.
(Contract EY-76-C-04-0789)
(SAND-78-0962-Vol-4) Avail: NTIS HC A11/MF A01

Two independent economic studies to assess the installed costs of a series six Darrieus vertical axis wind turbine designs are summarized. The designs cover a range of sizes with peak outputs from 10 to 1600 kW. And are designed produce utility grid electrical power. A comparison and analysis of the studies is presented. DOE

N80-16543# Illinois Univ., Urbana. Fusion Studies Lab.
DIRECT ENERGY CONVERSION SYSTEMS
G. H. Miley 1978 11 p refs Presented at the Meeting on the Technology of Controlled Thermonuclear Fusion, Santa Fe, N. Mex., 9 May 1978
(Contract EY-76-S-02-2218)
(COO-2218-117; CONF-780508-73) Avail: NTIS HC A02/MF A01

The potential importance of direct energy conversion to the long-term development of fusion power is discussed with stress on the possibility of alleviating waste heat problems. Two approaches to direct conversion, i.e., direct collection and magnetic expansion are reviewed. DOE

N80-16544# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
SPIN TEST OF THE UNIVERSITY OF CALIFORNIA, LAWRENCE LIVERMORE LABORATORY COMPOSITE FLYWHEEL AT THE APPLIED PHYSICS LABORATORY, THE JOHNS HOPKINS UNIVERSITY, ON 18 JULY 1978 Final Report
D. W. Rabenhorst and T. R. Small 15 Sep. 1978 15 p ref
(Contract W-7405-eng-48)
(UCRL-13910) Avail: NTIS HC A02/MF A01

The Livermore flywheel is a composite structure of laminated, unidirectional, carbon fiber epoxy layers arranged in a quasi-isotropic structural pattern. The flywheel was built up of 160 layers of this unidirectional material with each layer oriented so that the axis of the fibers was 45 degrees from the fibers in the preceding layers. This 45 degree progressive lay-up was arranged so that the flywheel would have mid-plane symmetry. Final cross-section shape of the flywheel was machined with carbide tools to a modified tapered form. The intent was to provide uniform stress throughout the flywheel in the spinning condition. The flywheel specifications, test facility, and spin test results are briefly discussed. DOE

N80-16545# Department of Energy, Washington, D. C. Div. of Technology Assessment.
HYDROTHERMAL ELECTRIC AND DIRECT HEAT. COMMERCIALIZATION PHASE 3 PLANNING
R. C. Clusen Sep. 1978 38 p
(DOE/ERD-0005) Avail: NTIS HC A03/MF A01

A technology program for the development of hydrothermal electric and direct heat energy is discussed. Environmental concerns identified over the commercialization of hydrothermal energy are examined. They include: airborne effluents, waterborne effluents, noise, subsidence, enhanced seismicity, water use conflicts, land use, socioeconomic impacts, and system safety and occupational health. A.W.H.

N80-16546# Delta Research Corp., Arlington, Va.
WORLDWIDE TRANSPORTATION/ENERGY DEMAND FORECAST, 1975 - 2000
R. U. Ayres Oct. 1978 103 p refs
(Contract W-7405-eng-26)
(ORNL/SUB-78/13536/1) Avail: NTIS HC A06/MF A01

Worldwide transportation energy demand for both commodities and passengers are forecast for 1975 - 2000. The long-range forecast methodology is described. Regional aggregation and economic/demographic projects are discussed. Transportation projections and transportation energy projections are presented. DOE

N80-16547# Department of Energy, Washington, D. C.
ADVANCED ELECTRIC GENERATION. COMMERCIALIZATION IN PHASE 3 PLANNING
Sep. 1978 46 p
(DOE/ERD-0014) Avail: NTIS HC A03/MF A01

Two basic technologies are under consideration for advanced electrical generation: fluidized-bed combustion (FBC) and phosphoric acid fuel cells. FBC consists of two major subtypes: atmospheric and pressurized fluidized-bed combustion. The fuel-cell power plant produces electricity by electrochemical conversion. The commercial readiness of these technologies with respect to environmental issues was investigated. Characteristics of the technologies and status information on the technical and environmental R and D programs are discussed. A milestone chart representing a relationship between a considered commercialization schedule and relevant environmental R and D is presented. Environmental concerns significant to the technologies were reviewed. The likelihood and consequences of adverse

findings, the problems and uncertainties stemming from current or anticipated environmental regulation, and potential costs of environmental control are examined. DOE

N80-16548# Sandia Labs., Albuquerque, N. Mex.
AERODYNAMIC HEATING OF HIGH-SPEED FLYWHEELS IN LOW-DENSITY ENVIRONMENTS
M. R. Baer Oct. 1978 46 p refs
(Contract EY-76-C-04-0789)
(SAND-78-0957) Avail: NTIS HC A03/MF A01

A computer code that interfaces with CINDA to predict the effects of aeroheating of high speed flywheels is presented. Slip flow aeroheating is examined for axisymmetric geometries for a steady state or transient calculation. The free molecular aeroheating on a flywheel is discussed. DOE

N80-16549# Argonne National Lab., Ill.
PEAK-LOAD PROBLEM WITH STORAGE TECHNOLOGY
J. G. Asbury and R. O. Mueller Aug. 1978 23 p refs
(Contract W-31-109-eng-38)
(ANL/SPG-8) Avail: NTIS HC A02/MF A01

The pricing and welfare implications of storage in a utility supply is examined. The method of analysis, which separates the load into storage and non-storable components, is described. DOE

N80-16550# Research Triangle Inst., Research Triangle Park, N. C.
APPLICATION ANALYSIS AND PHOTOVOLTAIC SYSTEM CONCEPTURAL DESIGN FOR SERVICE/COMMERCIAL/INSTITUTIONAL AND INDUSTRIAL SECTORS, TASK 1 REPORT
R. A. Whisnant, R. D. Alberts, R. M. Burger, R. P. Gardner, C. B. Morrison, and N. G. Staffa Jul. 1978 155 p refs
(Contract EY-76-C-04-0789)
(SAND-78-7032) Avail: NTIS HC A08/MF A01

The approach used to identify applications in the defined sectors for photovoltaic conversion are: (1) The Standard Industrial Classification Codes and to describe the applications that must be considered and data on the attributes of these applications germane to solar photovoltaic systems application. (2) The expected profitability of photovoltaic applications was determined from the discounted future costs of conventional energy sources, capital costs, and projected operating and maintenance costs over the life of the system. This was combined with the energy consumption of the application to obtain an estimate of the energy market potential. (3) The application ranking and subjective evaluations of market size, diversity, and public exposure were used to select five applications and their locations for design of a suitable photovoltaic system. (4) For each of the selected applications, the various relevant characteristics were identified, potential photovoltaic system configurations were defined, and performance and economic models were used to design a representative system. The design of the selected system is described. DOE

N80-16551# Oak Ridge National Lab., Tenn.
PERFORMANCE EVALUATION OF A LOW-FIRST-COST, THREE-TON, AIR-TO-AIR HEAT PUMP IN THE HEATING MODE
A. A. Domingorena Oct. 1978 88 p ref
(Contract W-7405-eng-26)
(ORNL/CON-18) Avail: NTIS HC A05/MF A01

A low cost, air to air, split system residential heat pump of nominal 3 ton capacity was instrumented and tested in the heating mode under laboratory conditions. The system was tested under both steady state and frosting defrosting conditions. From the steady state tests, the heating capacity and coefficient of performance were determined and evaluations of fan performance, heat exchanger and capillary tube performance, compressor performance, and system heat losses were made. The frosting defrosting tests provided information for evaluating both system and component performance under dynamic conditions. Tests were also conducted to determine the effect of the amount of refrigerant charge on system performance. DOE

N80-16552# Battelle Pacific Northwest Labs., Richland, Wash.
FACTORS AFFECTING POTENTIAL MARKET PENETRATION OF LASER FUSION POWER PLANTS
D. E. Deonigi and D. W. Fraley Aug. 1979 43 p refs
(Contract EY-76-C-06-1830)
(PNL-2803) Avail: NTIS HC A03/MF A01

A mini model constructed to estimate the optimal size of laser fusion power plants and to estimate the allowable cost of the first such plant in relation to the next best alternative is described. The mini model incorporates such factors as market penetration, learning, economies of scale, system size, transmission costs, reserve requirements, development and licensing costs and site costs. The results of the mini model simulations are discussed. DOE

N80-16553# New Mexico Energy Inst., Las Cruces.
PERFORMANCE EVALUATION OF THE NEW MEXICO STATE UNIVERSITY SOLAR HOUSE Final Report, 1 Jan. 1977 - 1 Jul. 1979
Thomas R. Mancini, Philip R. Smith, and John L. Peterson May 1979 34 p refs
(PB-301225/9; NMEI-17) Avail: NTIS HC A03/MF A01 CSCL 13A

The conversion efficiency of the solar heated and cooled New Mexico State University house is evaluated. The design of the solar house which incorporates energy efficient elements of passive solar systems to minimize both the heating and cooling loads, is described. The liquid type solar system which employs flat plate collectors is examined. The performance evaluation consisted of sampling thirty six data points at ten minute intervals, monitoring the heating system and electrical power consumption of the solar equipment, and collecting environmental data such as solar radistion perpandicular to the plane of the collectors, wind speed, ambient temperature and relative humidity, and measuring the temperature and flowrate through the system. The data collection method is discussed and the instrumentation and accuracy of the measurements is reported. A.W.H.

N80-16554# Resources for the Future, Inc., Washington, D. C.
CONTRIBUTIONS TO THE FOUNDATIONS OF SUPPLY FOR ENERGY AND TRANSPORTATION: CONCEPTS, ECONOMICS, AND TECHNOLOGIES
James W. Sawyer, Jr. Mar. 1979 224 p refs
(Grant NSF AER-75-16163)
(PB-300541/0; NSF/RA-790116) Avail: NTIS HC A10/MF A01

The energy problem and its possible effects on transportation, interaction between energy issues and policies, and transportation issues and policies is emphasized. The development of the energy crisis is reviewed and the transition to new energy sources is discussed. Following sections include: discussions of energy resource reserves; the characterization of likely future pricing of energy resources; engineering and economic descriptions of actual and potential synfuel processes; energy as a transportation fuel and as a commodity to be transported; descriptions of the energy and transportation models used; descriptions of the model runs and projections; impacts, emerging issues, and brief discussions of some of the policy options open in both transportation and energy areas. GRA

N80-16555# General Accounting Office, Washington, D. C. Energy and Minerals Div.
FEDERAL DEMONSTRATIONS OF SOLAR HEATING AND COOLING ON PRIVATE RESIDENCES: ONLY LIMITED SUCCESS Report to the Congress
9 Oct. 1979 65 p refs
(PB-301123/6; EMD-79-55) Avail: NTIS HC A04/MF A01 CSCL 10A

The residential solar heating and cooling demonstration program implemented by the Department of Housing and Urban Development for the Department of Energy is analyzed. A perspective on the program, an evaluation of its success in demonstrating solar heating systems, and a discussion of the prospects for demonstrating solar cooling technologies are included. GRA

N80-16556# Berg (Charles A.), Buckfield, Maine.
ENERGY CONSERVATION IN INDUSTRY: THE PRESENT APPROACH, THE FUTURE OPPORTUNITIES Final Report
Charles A. Berg May 1979 96 p refs
(Contract EQ7AD505)

(PB-301244/0) Avail: NTIS HC A05/MF A01 CSCL 10A

Possible opportunities for industry to conserve energy through the introduction of new technology are considered. It is indicated that these technology options offer far greater savings of energy and of all other resources required in production than modifying the operation of existing plants, toward which present energy conservation efforts are directed. GRA

N80-16557# National Technical Information Service, Springfield, Va.

SOLAR ENERGY CONCENTRATOR DESIGN AND OPERATIONS. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1976 - Jul. 1979

Audrey S. Hundemann Sep. 1979 183 p Supersedes NTIS/PS-78/0838 Updates NTIS/PS-77/0458 2 Vol.
(NTIS/PS-79/0926/0; NTIS/PS-78/0838) Avail: NTIS HC $28.00/MF $28.00 CSCL 10A

Government-funded research on the design and operation of various types of solar energy concentrators is discussed. Abstracts cover the efficiency and optimization of Fresnel lenses, V-trough concentrators, flat plate and parabolic reflectors, compound parabolic concentrators used in solar photovoltaic conversion, and heliostat systems. A few abstracts deal with heat loss and cost studies. (This updated bibliography contains 177 abstracts, 80 of which are new entries to the previous edition.) GRA

N80-16558# National Technical Information Service, Springfield, Va.

SOLAR ENERGY CONCENTRATOR DESIGN AND OPERATIONS. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Jul. 1979

Audrey S. Hundemann Sep. 1979 225 p Supersedes NTIS/PS-78/0839 Updates NTIS/PS-77/0459 2 Vol.
(NTIS/PS-79/0927/8; NTIS/PS-78/0839) Avail: NTIS HC $28.00/MF $28.00 CSCL 10A

Worldwide research on the design and operation of various types of solar energy concentrators is discussed. Topic areas cover thermal and optical performance of Fresnel lenses, compound parabolic concentrators, fixed mirror concentrators, and planar reflector enhancement of flat plat collector systems. A few abstracts deal with V-trough concentrators and methods to calculate performance of concentrators. A separate Published Search on heliostat systems is available. This updated bibliography contains 220 abstracts, 53 of which are new entries to the previous edition. GRA

N80-16559# Michigan Univ., Ann Arbor. Highway Safety Research Inst.

COPING WITH ENERGY LIMITATIONS IN TRANSPORTATION: PROPOSALS FOR MICHIGAN

Robert Kaufman and Herman Koenig Apr. 1979 49 p refs Sponsored by Michigan Dept. of Transportation
(PB-299737/7; UM-HSRI-79-13) Avail: NTIS HC A03/MF A01 CSCL 10B

The transportation energy dependence of Michigan's economy and major industries is discussed and quantified. Alternative energy forms and automotive propulsion systems are surveyed and assessed. Probable economic impacts on Michigan are discussed and the dual pressures of rising transport energy costs and federal regulations on the auto industry are outlined. State action for managing the economic transition which Michigan faces is recommended, and a mechanism for managing change is proposed. GRA

N80-16560# National Bureau of Standards, Washington, D.C. National Engineering Lab.

AN INVESTIGATION OF PREFERENCES FOR VARIOUS TYPES OF ENERGY COST FEEDBACK Final Report

Ann Rammey-Smith and Jennifer L. Gagnon Aug. 1979 73 p refs Sponsored by DOE
(PB-300314/2; NBSIR-79-1771) Avail: NTIS HC A04/MF A01 CSCL 10B

The issue of consumer preferences for various types of energy cost feedback for individual consumers is addressed. Recommendations related to the performance characteristics of energy cost feedback devices for use in testing energy cost feedback meters are examined. GRA

N80-16561# Old West Regional Commission, Billings, Mont.

ENERGY RESEARCH INFORMATION SYSTEM (ERIS) PROJECTS REPORT, VOLUME 4, NUMBER 1 Progress Report, Dec. 1978 - Jun. 1979

Catherine A. Boyd, comp. and Janet Jelinek, comp. Jun. 1979 88 p Prepared in cooperation with Geological Survey, Reston, Va. and Argonne National Lab., Ill.
(PB-300338/1; OWRC/ERIS-7906) Avail: NTIS HC A05/MF A01 CSCL 10B

An inventory of the energy related programs and research activities from 1974 to the present in the states of Montana, Nebraska, North Dakota, South Dakota, and Wyoming is presented. Areas of research include: coal, petroleum, oil shales, fission fuels, synthetic fuels, hydro-energy, renewable energy, resources, energy policy, reclamation, socioeconomic impacts, environmental impacts, and land use. Each project description lists title, investigator(s), research institution, sponsor, funding, time frame, location, a descriptive abstract of the research, and the titles of reports and/or publications generated by the research. GRA

N80-16562# New Mexico Energy Inst., Las Cruces.

ADDITION OF AN AIR-COOLED COLLECTOR TEST CAPABILITY TO THE SOLAR COLLECTOR TEST FACILITY Final Report, 1 Jan. 1977 - 30 Jun. 1978

H. L. Connell Jun. 1979 41 p refs Sponsored in part by the New Mexico Energy and Minerals Dept.
(Contract ERB-76-259)
(PB-300482/7; NMEI-43) Avail: NTIS HC A03/MF A01 CSCL 10A

The design and fabrication of test stands with adjustable-tilt collector mounting frames is discussed. The air flow and conditioning circuits, and the integration of the required temperature and pressure instrumentation are also discussed. GRA

N80-16563# National Technical Information Service, Springfield, Va.

ENERGY POLICY AND RESEARCH PLANNING, VOLUME 3. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, Oct. 1977 - Sep. 1979

Andrey S. Hundemann Sep. 1979 184 p Supersedes NTIS/PS-78/0962; NTIS/PS-77/0839; NTIS/PS-76/0710
(NTIS/PS-79/1069/8; NTIS/PS-78/0962; NTIS/PS-77/0839; NTIS/PS-76/0710) Avail: NTIS HC $28.00/MF $28.00 CSCL 10A

Citations relative to planning for future U.S. energy needs on both national and state government levels are presented. The history and development of national and state legislation and regulations, Project Independence studies, and assessment of the effects of deregulation are included. Technical, economic, and environmental considerations in energy planning are also covered. GRA

N80-16564# SRI International Corp., Menlo Park, Calif.

COMPARATIVE ASSESSMENT OF RESIDENTIAL ENERGY SUPPLY SYSTEMS THAT USE FUEL CELLS: EXECUTIVE SUMMARY Final Report, Sep. 1976 - Jan. 1979

R. V. Steele, D. C. Bomberger, K. M. Clark, R. F. Goldstein, R. L. Hays, M. E. Gray, and G. Ciprios Apr. 1979 15 p
(Contract EPA-68-02-2180)
(PB-299207/1; EPA-600/7-79-105A) Avail: NTIS HC A02/MF A01 CSCL 10B

A comparison of residential energy supply systems using fuel cells is presented. All systems used coal as the primary energy source, and all residences were assumed to have identical heating and cooling demands. Five systems were analyzed in detail and the entire energy cycle, from coal mine to end use, was examined for costs, efficiency, environmental impact, and applicability. The five energy systems are: (1) a coal fired power plant supplying electricity and a coal gasification plant supplying SNG; (2) a 26 MW fuel cell power plant fueled by coal derived SNG supplying electricity; (3) a 26 MW fuel cell power plant fueled by coal derived naphtha supplying electricity; (4) a combined cycle power plant fueled by coal derived fuel oil supplying electricity; and (5) a 100 kW fuel cell power plant fueled by coal derived SNG. GRA

N80-16565# SRI International Corp., Menlo Park, Calif.

COMPARATIVE ASSESSMENT OF RESIDENTIAL ENERGY

SUPPLY SYSTEMS THAT USE FUEL CELLS Final Report, Sep. 1976 - Jan. 1979
R. V. Steele, D. C. Bomberger, K. M. Clark, R. F. Goldstein, R. L. Hays, M. E. Gray, and G. Ciprios Apr. 1979 505 p refs (Contract EPA-68-02-2180)
(PB-299208/9; EPA-600/7-79-105B) Avail: NTIS HC A22/MF A01 CSCL 10B

A comparison of residential energy supply systems using fuel cells is presented. Twelve energy systems, able to provide residential heating and cooling using technologies projected to be available toward the end of this century, were designed conceptually. Five systems were analyzed in detail. The entire energy cycle, from coal mine to end use, was examined for costs, efficiency, environmental impact, and applicability. The five energy systems were: (1) a coal fired power plant supplying electricity and a coal gasification plant supplying SNG; (2) a 26 MW fuel cell power plant fueled by coal derived SNG supplying electricity; (3) a 26 MW fuel cell power plant fueled by coal derived naphtha supplying electricity; (4) a combined cycle power plant fueled by coal derived fuel oil supplying electricity; and (5) a 100 kW fuel cell power plant fueled by coal derived SNG, sited in a housing complex, supplying electricity to heat pumps, with heat recovered from the fuel cell supplying supplemental space heating and hot water. GRA

N80-16566# National Technical Information Service, Springfield, Va.
FLAT PLATE SOLAR COLLECTOR DESIGN AND PERFORMANCE. CITATIONS FROM THE NTIS DATA BASE Progress Report, 1976 - Jul. 1979
Audrey S. Hundemann Sep. 1979 168 p Supersedes NTIS/PS-78/0840
(NTIS/PS-79/0928/6; NTIS/PS-78/0840) Avail: NTIS HC $28.00/MF $28.00 CSCL 10A

Federally-funded research on the design and thermal efficiency of air- and liquid-type flat plate collectors is discussed. Topic areas cover convection characteristics, methods to reduce heat loss, optical coatings, and corrosion control. Emphasis of the bibliography is on basic research studies. (This updated bibliography contains 160 abstracts, 63 of which are new entries to the previous edition.) GRA

N80-16567# National Technical Information Service, Springfield, Va.
FLAT PLATE SOLAR COLLECTOR DESIGN AND PERFORMANCE. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Jul. 1979
Audrey S. Hundemann Sep. 1979 180 p Supersedes NTIS/PS-78/0841
(NTIS/PS-79/0929/4; NTIS/PS-78/0841) Avail: NTIS HC$28.00/MF$28.00 CSCL 10A

Citations from worldwide literature on the design, thermal performance, and optimization of air- and liquid-type flat plate collectors are covered. Topic areas include heat loss and heat transfer, effect of orientation, corrosion protection, optical coatings, enhancement of performance through the use of planar reflectors, and the effect of honeycomb layers on collector performance. A few studies pertain to grooved, corrugated, or V-trough collectors. Abstracts dealing with methods of measuring the performance of flat plate collectors and computer optimization studies are included. This bibliography contains 174 abstracts, 30 of which are new entries to the previous edition. GRA

N80-16568# Economics, Statistics and Cooperatives Service, Washington, D. C. National Economics Div.
SOLAR ENERGY FOR AGRICULTURE: REVIEW OF RESEARCH Final Report
W. K. Trotter, W. G. Heid, Jr., and R. G. McElroy Aug. 1979 29 p refs
(PB-298688/3; ESCS-67) Avail: NTIS HC A03/MF A01 CSCL 02B

Solar energy use in various agricultural applications is summarized. Grain drying, heating and cooling of greenhouses and rural residences, heating livestock shelters, drying crops other than grain, food processing, and irrigation are discussed. An exploratory economic assessment of solar energy technologies is given. GRA

N80-16569# New Mexico Energy Inst., Las Cruces.
FEASIBILITY STUDY OF GEOTHERMAL ENERGY FOR HEATING GREENHOUSES Final Report, 1 Jan. - 31 Aug. 1977
Leo J. LaFrance Jun. 1979 24 p refs Sponsored in part by New Mexico Energy and Minerals Dept.
(PB-299517/3; NMEI-41) Avail: NTIS HC A02/MF A01 CSCL 02C

The technical feasibility of heating greenhouses with low temperature, 212 F (100 C) and below, geothermal sources is established. The economic feasibility of using geothermal energy to heat greenhouses is summarized. Candidate greenhouse facilities in New Mexico were determined for conversion to geothermal energy as well as sites favorable for new greenhouse construction. GRA

N80-16570# New Mexico Energy Inst., Las Cruces.
SOLAR POWERED AGRICULTURAL IRRIGATION PUMPING Final Report, 1 Jun. 1976 - 28 Feb. 1979
G. H. Abernathy and T. R. Mancini 15 Feb. 1979 31 p refs
(PB-299294/9; NMEI-31) Avail: NTIS HC A03/MF A01 CSCL 02C

A solar-powered irrigation pumping system was designed and installed at Willard, New Mexico. The system incorporated an east-west oriented field of parabolic trough solar collectors to heat oil. The hot oil in turn heated freon which drove a high speed turbine connected to the irrigation pump. In conjunction with the solar pump, agricultural experiments were conducted. These included drip irrigation of typical food crops that could be grown in the area. GRA

N80-16571# National Technical Information Service, Springfield, Va.
HELIOSTAT SYSTEM DESIGN AND OPERATION. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1970 - Jul. 1979
Audrey S. Hundemann Sep. 1979 61 p Supersedes NTIS/PS-78/0842
(NTIS/PS-79/0930/2; NTIS/PS-78/0842) Avail: NTIS HC $28.00/MF $28.00 CSCL 10A

The design and use of heliostats in solar central receiver thermal power systems are discussed in abstracts from worldwide literature. Topic areas include heliostat systems performance, efficiency, and optimization. Emphasis of the bibliography is on basic research. (This updated bibliography contains 55 abstracts, 17 of which are new entries to the previous edition.) GRA

N80-16572# National Bureau of Standards, Washington, D.C. National Engineering Lab.
PERFORMANCE OF A PACKAGED SOLAR SPACE-HEATING SYSTEM USED WITH A MOBILE HOME
Dennis E. Jones and James A. Hill Aug. 1979 45 p refs Sponsored in part by HUD, Washington, D.C. Div. of Energy, Building Technol. and Standards
(PB-300890/1; NBSIR-79-1799) Avail: NTIS HC A03/MF A01 CSCL 13A

A mobile home was equipped with a packaged solar space-heating system using air heating collectors and pebble bed shortage. The system was fully instrumented and data were collected. The performance of the system was determined and various methods of correlating performance were explored. GRA

N80-16215*# Oklahoma Univ., Norman. School of Aerospace, Mechanical and Nuclear Engineering.
LATERAL AND TILT WHIRL MODES OF FLEXIBLY MOUNTED FLYWHEEL SYSTEMS
C. W. Bert and T. L. C. Chen *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 35-46 refs Sponsored by DOE (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 10B

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N80-16573 Rutgers - The State Univ., New Brunswick, N. J.
AN ANALYSIS OF THE FACTORS AFFECTING THE

DISTRIBUTION OF HEAVY METALS IN A TIDAL ESTUARY Ph.D. Thesis
Santo Vincent Grasso 1979 288 p
Avail: Univ. Microfilms Order No. 7928404

An analysis of the factors affecting the distribution of Cd, Cu, Mn, Ni, Pb and Zn in the waters and sediments of the Hackensack River between River Mile 12 and 20.9 was conducted. The two major sources of metals to the area were found to be discharges from the Bergen County Sewerage Authority and contributions from runoff. For the year 1975, the Bergen County Sewerage Authority accounted for 100, 65, 99, 89, 57, and 80% respectively of the Cd, Cu, Mn, Ni, Pb, and Zn discharged into the area. Runoff accounted for most of the remaining portion. Soluble nickel and zinc levels in the river water were similar to the levels contained in the EPA STORET data. The levels of the remaining metals showed marked deviations from the EPA data. Suspended metals were found to exhibit positive correlation with the percentage of fixed suspended matter. Dissert. Abstr.

N80-16574 California Univ., Los Angeles.
THE ENVIRONMENTAL PROTECTION AGENCY'S ROLE IN THE PROTECTION OF WETLANDS: EXAMINATION OF EPA'S PARTICIPATION IN THE SECTION 404 REGULATORY PROGRAM Ph.D. Thesis
Jocelyn Mae Spiszman 1979 193 p
Avail: Univ. Microfilms Order No. 8001407

The legislative history of Section 404 is examined along with the goals and objectives of the EPA's 1978 program plan. Issues which may adversely affect EPA's ability to meet 404 program goals are identified. Material for the analysis of issues is derived from interviews with key agency people, members of the technical community and members of public interest groups with expressed concern of protection of wetland resources. The issues are examined in detail and options for their resolution are considered. A case study is presented in order to illustrate more fully how such issues affect EPA's ability to implement its responsibilities under Section 404. Dissert. Abstr.

N80-16575*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SUMMARY OF AIRCRAFT RESULTS FOR 1978 SOUTHEASTERN VIRGINIA URBAN PLUME MEASUREMENT STUDY OF OZONE, NITROGEN OXIDES, AND METHANE
Gerald L. Gregory, Dewey E. Wornom, Joe J. Mathis, Jr., and Daniel I. Sebacher Washington Feb. 1980 222 p refs
(NASA-TM-80146; L-12981) Avail: NTIS HC A10/MF A01 CSCL 13B

Ozone production was determined from aircraft and surface in situ measurements, as well as from an airborne laser absorption spectrometer. Three aircraft and approximately 10 surface stations provided air-quality data. Extensive meteorological, mixing-layer-height, and ozone-precursor data were also measured. Approximately 50 hrs (9 flight days) of data from the aircraft equipped to monitor ozone, nitrogen oxides, dewpoint temperature, and temperature are presented. In addition, each experiment conducted is discussed. A.R.H.

N80-16576*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
COOLING TOWER WATER CONDITIONING STUDY
M. F. Humphrey and K. R. French 15 Dec. 1979 44 p refs
(Contract NAS7-100)
(NASA-CR-162691; JPL-PUB-79-104) Avail: NTIS HC A03/MF A01 CSCL 13B

Successful elimination of cooling tower treatment chemicals was demonstrated. Three towers functioned for long periods of time with ozone as the only treatment for the water. The water in the systems was reused as much as 30 times (cycles of concentration) without deleterious effects to the heat exchangers. Actual system blow-down was eliminated and the only makeup water added was that required to replace the evaporation and mist entrainment losses. Minimum water savings alone are approximately 75.1 l/kg/year. Cost estimates indicate that a savings of 55 percent was obtained on the systems using ozone. A major problem experienced in the use of ozone for cooling tower applications was the difficulty of accurate concentration measurements. The ability to control the operational characteristics relies on easily and accurately determined concentration levels. Present methods of detection are subject to inaccuracies because of interfering materials and the rapid destruction of the ozone. J.M.S.

N80-16577*# Columbia Univ., New York.
RESEARCH PLAN FOR ESTABLISHING THE EFFECTS OF TIME VARYING NOISE EXPOSURES ON COMMUNITY ANNOYANCE AND ACCEPTABILITY
Paul N. Borsky Jan. 1980 99 p refs
(Grant NsG-1616)
(NASA-CR-159197) Avail: NTIS HC A05/MF A01 CSCL 13B

The design of a community noise survey to determine the effects of time varying noise exposures in residential communities is presented. Complex physical and human variables involved in the health and welfare effects of environmental noise and the number-level tradeoffs and time of day penalties are among the factors considered. Emphasis is placed on community reactions where noise exposures are equal in day or evening but differ in the night time, and the effects of ambient noise on more intense aircraft noise exposures. Thirteen different times of day and types of operation situations with exposed populations up to 8-10 miles from the airport are identified. A detailed personal interview questionnaire as well as specific instructions to interviewers are included. J.M.S.

N80-16578*# Research Triangle Inst., Research Triangle Park, N. C.
ALTITUDE CHARACTERISTICS OF SELECTED AIR QUALITY ANALYZERS Final Report
J. H. White, R. Strong, and J. B. Tommerdahl Nov. 1979 32 p
(NASA Order L-96783-A; RTI Proj. 43U-1833)
(NASA-CR-159165; RTI/1833/00-03F) Avail: NTIS HC A03/MF A01 CSCL 13B

The effects of altitude (pressure) on the operation and sensitivity of various air quality analyzers frequently flown on aircraft were analyzed. Two ozone analyzers were studied at altitudes from 600 to 7500 m and a nitrogen oxides chemiluminescence detector and a sulfur dioxide flame photometric detector were studied at altitudes from 600 to 3000 m. Calibration curves for altitude corrections to the sensitivity of the instruments are presented along with discussion of observed instrument behavior. K.L.

N80-16579# George Washington Univ., Washington, D. C. Program in Logistics.
OPTIMAL TREATMENT LEVELS OF A STREAM POLLUTION ABATEMENT SYSTEM UNDER THREE ENVIRONMENTAL CONTROL POLICIES. PART 2: PRELIMINARY SENSITIVITY ANALYSIS OF A CONVEX EQUIVALENT OF THE FIXED DISSOLVED OXYGEN REQUIREMENT POLICY GP MODEL USING SENSUMT
Anthony V. Fiacco and Aboilfazl Ghaemi 29 Jun. 1979 45 p refs
(Contract N00014-75-C-0729)
(AD-A074216; SERIAL-T-405-Pt-2) Avail: NTIS HC A03/MF A01 CSCL 13/2

The sensitivity is analyzed of the optimal waste treatment cost of a water pollution control model, with respect to the parameters involved in the formulation of the model. This analysis is conducted for the policy mandating a fixed dissolved oxygen requirement, using an upper Hudson River data base. Details concerning the formulation and solution of this problem were reported in another paper. It is shown here that the maximum allowable dissolved oxygen deficit is unequivocally the parameter to which the optimal waste treatment cost is most sensitive. All of the many parameters involved in the model are analyzed and, relative to stipulated assumptions, are shown to have from significant to negligible impact on the waste treatment cost. GRA

N80-16580# Brookhaven National Lab., Upton, N. Y. Atmospheric Sciences Div.
STATUS OF POLLUTANT REMOVAL TECHNOLOGY FOR COAL FIRED PLANTS IN THE NORTHEASTERN U.S.

E. N. Ziegler (Polytechnic Inst. of N.Y., Brooklyn) and Ronald E. Meyers Feb. 1979 44 p refs
(Contract EY-76-C-02-0016)
(BNL-51004) Avail: NTIS HC A03/MF A01

The status of air pollution control technology for coal fired industrial and power plant boilers is surveyed. Lime and limestone based scrubbers, the Wellman-Lord, thiosorbic, and citrate processes, electrostatic precipitators, fabric filtration, and modification of the combustion system to reduce nitrogen oxide concentrations are among the technology items covered. Various process capital and annualized costs are reported for SO2 and particulate removal systems. The status of fluidized bed combustion, fuel desulfurization, coversion of coal to gaseous and liquid fuels, and flue gas denitrification is also discussed.
DOE

N80-16581# Department of Energy, Washington, D. C.
PETROLEUM PRODUCTION AT MAXIMUM EFFICIENT RATE, NAVAL PETROLEUM RESERVE NO. 1 (ELK HILLS), KERN COUNTY, CALIFORNIA Final Environmental Impact Statement
Aug. 1979 525 p refs
(DOE/EIS-0012) Avail: NTIS HC A22/MF A01

The Naval Petroleum Reserves were opened up for production at maximum efficient rates consistent with sound engineering practices, for a period of 6 years. Production for Naval Petroleum Reserve No. 1 is expected to peak at between 205,000 and 240,000 bbl/d of crude oil in 1982. Positive impacts of the project are increased employment, use of vacant housing, increased local spending on goods and services, and the potential for increased domestic petroleum production with a commensurate decrease in the US balance of payment deficit. Adverse effects of the project include increased air pollution emissions, increased noise levels, reduction in vegetation, loss of the Petroleum Reserve for use in emergency situations, increased traffic levels, and decreased visual quality.
DOE

N80-16582# New York Univ., N. Y. Inst. of Environmental Medicine.
TRACE ORGANIC COMPOUNDS IN THE NEW YORK CITY ATMOSPHERE. PART 1: PRELIMINARY STUDIES Interim Report
J. M. Daisey, ed. 1979 105 p refs
(EPRI-EA-1121) Avail: NTIS HC A06/MF A01

The kinds and concentrations of organic compounds present in New York City air, with particular emphasis on those classes which are biologically active (and which may pose a health hazard) were investigated. The results indicate the presence of alkylating agents, N-nitrosamines and peroxides as well as polycyclic aromatic hydrocarbons. Direct acting mutagens are also present in two polar and one nonpolar organic fractions of particulate matter. Very little seasonal variation was observed in the mutagenic activity (per microgram) of the organic fractions. Airborne concentrations of extractable organic matter in total suspended particulate matter (TSP) do not appear to have changed significantly from the levels of 9 to 12 micrograms/cu m, although TSP has declined by more than 50 percent.
DOE

N80-16583# Radian Corp., Austin, Tex.
HAOS QUALITY ASSURANCE FINAL REPORT: CRITERIA POLLUTANTS, VOLUME 1 Final Report
Dec. 1978 119 p refs
(PB-299639/5; RAD-79-201-177-04-Vol-1; HAOS-13) Avail: NTIS HC A06/MF A01 CSCL 13B

A comprehensive quality assurance program was conducted to determine the validity and comparability of the data obtained during the monitoring phase. Audits were conducted for the following parameters: ozone, NOx, SO2, total hydrocarbons and methane, CO, and total suspended particulates. The results of the audits were generally good and demonstrated the validity and comparability of the data taken by the diverse monitoring groups. Although the SO2 and CO audit data were generally low and variable, good agreement was obtained for ozone, oxides of nitrogen, THC, CH4, and TSP.
GRA

N80-16584# Radian Corp., Austin, Tex.
HAOS QUALITY ASSURANCE: NON-CRITERIA POLLUTANTS, VOLUME 2 Final Report
Mar. 1979 132 p refs
(PB-299640/3; RAD-79-201-177-03-Vol-2; HAOS-14) Avail: NTIS HC A07/MF A01 CSCL 13B

Independent sensor audits or audit observations were conducted on the following perimeters: detailed hydrocarbons, PAN, total oxidants, human visibility, light scattering, visibility using telephotometry respirable particle sampling and analysis aeroallergens, UV radiation, upper air meteorological measurements, and aldehydes. There were no known standards for some measurements and no approved standard reference methods to calibrate and audit others. Thus, accuracy determinations were difficult, if not impossible. Consequently, it was judged that it was more important to look for trends in the audit data which might explain any anomalies in the monitoring data, or which might identify problems in particular agency procedures.
GRA

N80-16585# Environmental Research and Technology, Inc., Westlake Village, Calif. Environmental Analysis Div.
A LAGRANGIAN PHOTOCHEMICAL AIR QUALITY SIMULATION MODEL: ADAPTATION TO THE ST. LOUIS RAPS DATA BASE. VOLUME 1: MODEL FORMULATION Final Report
Fred Lurman, Daniel Godden, Alan C. Lloyd, and Richard A. Nordsieck Jun. 1979 152 p refs
(Contract EPA-68-02-2765)
(PB-300470/2; EPA-600/8-79-015A-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 04A

A Lagrangian photochemical air quality simulation model was adapted to the St. Louis, Missouri/Illinois metropolitan region and the Regional Air Pollution Study aerometric and emissions data base. This adaptation was performed to provide a means for EPA to independently assess the validity of a state-of-the-art Lagrangian photochemical model. Chemical kinetic oxidation mechanisms involving hydrocarbons, nitrogen oxides and sulfur oxides and a vertical diffusion formulation for modeling reactive pollutants in the troposphere are described. Methods for determining model input parameters are discussed and model results for ozone, nitrogen dioxide, carbon dioxide, sulfur dioxide, and sulfate are presented.
GRA

N80-16586# Environmental Research and Technology, Inc., Westlake Village, Calif. Environmental Analysis Div.
A LAGRANGIAN PHOTOCHEMICAL AIR QUALITY SIMULATION MODEL: ADAPTATION TO THE ST. LOUIS RAPS DATA BASE. VOLUME 2: USER'S MANUAL Final Report
Fred Lurman, Daniel Godden, Alan C. Lloyd, and Richard A. Nordsieck Jun. 1979 448 p
(Contract EPA-68-02-2765)
(PB-300471/9; EPA-600/8-79-015B-Vol-2) Avail: NTIS HC A19/MF A01 CSCL 04A

A set of instructions was compiled for use of a Lagrangian photochemical air quality simulation model adapted to the St. Louis, Missouri/Illinois metropolitan region and the Regional Air Pollution Study (RAPS) data base. The computer model consists of a set of computer programs for the simulation of atmospheric transport, turbulent diffusion, and chemical kinetics of photochemical pollutants. The computational procedures for using the model and a listing of the computer code are investigated.
GRA

N80-16587# California Univ., Riverside.
NITRATE IN EFFLUENTS FROM IRRIGATED LANDS Final Report
P. F. Pratt, J. W. Biggar, F. R. Broadbent, D. D. Focht, John Letey, L. J. Lund, A. D. McLaren, D. R. Nielsen, L. H. Stolzy, P. R. Stout et al May 1979 813 p refs
(Grants NSF GI-34733X; NSF GI-43664; NSF AEN-74-11136; NSF ENV-76-10283; NSF PFR-76-10283)
(PB-300582/4; NSF/RA-790107) Avail: NTIS HC A99/MF A01 CSCL 13B

Capabilities were developed to predict the concentrations of NO3(-) in drainage waters that move through the root zone of irrigated croplands and become effluents in tile drains or that move by unsaturated flow to the saturated zone. The kinetics of nitrogen transformations were studied by measuring N transformations from urea through the oxidative process to NO3(-) and

then back to gaseous forms by denitrification and testing kinetic models of these processes. An attempt was made to determine the influence of soil morphology and soil profile characteristics on NO3(-) leaching from the soil-root zone in bench-mark soils. An N balance was approximated for the Santa Maria Valley based on N inputs, crop removals, leaching losses, and losses by denitrification. GRA

N80-16589# Midwest Research Inst., Kansas City, Mo.
FINE PARTICLE EMISSIONS INFORMATION SYSTEM Annual Report, Jan. - Dec. 1978
M. P. Schrag, J. P. Reider, and F. N. Young May 1979 54 p refs
(Contract EPA-68-02-2641)
(PB80-100449; EPA-600/7-79-126) Avail: NTIS HC A04/MF A01 CSCL 05B

A computerized data base on primary fine particle emissions from stationary sources is described. Changes made in 1978, including the expanded reporting of chemical analysis data, the entering of confidential or proprietary data, the entering of confidential or proprietary data, and the development of computer software to aid users in interpreting the Fine Particle Emissions Information System (FPEIS) data are summarized. Data added to the FPEIS in 1978 and objectives for 1979, including the addition of biological and radiological analysis results and the implementation of a new source categorization protocol are included. The FPEIS provides a centralized inventory of fine particle measurement information for researchers engaged in fine particle control technology development and in the environmental assessment of energy and industrial processes. GRA

N80-16589# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Plant Pathology and Physiology.
OXIDANT AIR POLLUTION IMPACT TO THE FORESTS OF EASTERN UNITED STATES: A LITERATURE REVIEW
John M. Skelly and J. William Johnson Apr. 1979 39 p refs
(Contract EPA-CC71142-J)
(PB80-103500; EPA-600/3-79-045) Avail: NTIS HC A03/MF A01 CSCL 06F

A review of past studies that have attempted to delineate measurable and/or possible impacts of photochemical oxidants on the forests of eastern United States is presented. Sources of oxidant precursors and subsequent long distance transport phenomena are reviewed and documented. Potential threats to eastern forest tree species are reviewed through a comparison of various fumigation studies in laboratory and field situations. The concept of hidden injury is discussed as being a possible major impact problem facing analysis of real losses. Evidence is presented that suggests that many forest tree species indigenous to the eastern United States may already be detrimentally impacted by previous high oxidant episodes. GRA

N80-16590# Midwest Research Inst., Kansas City, Mo.
ANALYSIS OF AIRBORNE VIABLE BACTERIA AT SOLID WASTE PROCESSING FACILITIES
M. W. Fletcher and D. E. Fiscus Aug. 1979 92 p refs
(Contract EPA-68-02-1871; MRI Proj. 4033-L)
(PB80-102338; EPA-600/2-79-131) Avail: NTIS HC A05/MF A01 CSCL 06F

Aerobiological testing methodologies used to determine relative levels of airborne bacteria and virus aerosols within and around waste handling facilities are described. Microbiological air sampling, field sample handling, and laboratory analysis methodologies are included. GRA

N80-16591# Geological Survey, Tallahassee, Fla. Water Resources Div.
SALTWATER-BARRIER LINE IN FLORIDA: CONCEPTS, CONSIDERATIONS, AND SITE EXAMPLES
Jerry L. Hughes Jun. 1979 38 p refs Prepared in cooperation with Florida Dept. of Environmental Regulations, Tallahasssee
(PB80-101306; USGS/WRI-79/75; USGS/WRD/WRI-79/073) Avail: NTIS HC A03/MF A01 CSCL 13B

The hydrologic concepts and fundamentals of saltwater intrusion in surface water channels and associated ground water systems are discussed in relation to a saltwater barrier line in Florida. The hydrological principles controlling saltwater intrusion along canals and streams and their significance in establishing a saltwater barrier line are discussed. The history of existing salinity barrier structures and their effectiveness in controlling saltwater intrusion are examined. The maintaining of a saltwater barrier line in the areas where such a line was established is described. A.W.H.

N80-16592# State Univ. of New York at Stony Brook. Marine Sciences Research Center.
TEXTURAL PROPERTIES OF SURFICIAL SEDIMENTS OF LOWER BAY OF NEW YORK HARBOR
Clifford R. Jones, Charles T. Fray, and J. R. Schubel Mar. 1979 121 p refs
(PB80-106479; SR-21; REF-79-4; NOAA-79091302) Avail: NTIS HC A06/MF A01 CSCL 08I

The textural properties of the surficial sediments of the Lower Bay of New York Harbor are described. The grain size distributions are summarized in tabular form. The spatial distributions of selected statistical parameters such as median diameter, mean diameter, standard deviation, skewness, and kurtosis are summarized. Twenty five areas in the Lower Bay of New York Harbor are dilimited on the basis of sediment texture. The textural properties of samples within each of these 25 areas are summarized. GRA

N80-16593# Hydronautics, Inc., Laurel, Md.
DESIGN, FABRICATION AND TESTING OF THE AIR-JET OIL BOOM Final Report
Steven H. Cohen and William T. Lindenmuth Jun. 1979 140 p refs
(Contract EPA-68-03-2497)
(PB80-102635; EPA-600/7-79-143) Avail: NTIS HC A07/MF A01 CSCL 13B

The boom presented has the capability to divert oil slicks under wave and current conditions that normally preclude the development of conventional booms. This boom can divert oil slicks at 3 knots with 85 percent efficiency when at 30 deg to the flow. The key operational feature is a continuous, horizontally oriented air jet ejected from along the boom at the water's surface. Overall, each boom module is about 33 feet long and 2 feet in diameter. Major components include two inflatable sections (ducts) to support the continuous air-jet nozzle and a center support float/jet pump. Some unique features of the structural design are low draft (1 inch) and excellent compliance to waves. Furthermore, the sections are both lightweight and highly compactible for storage. GRA

N80-16594# New York Sea Grant Inst., Albany.
THE LOWER BAY COMPLEX
Iver W. Duedall, Harold B. OConnors, Robert E. Wilson, and Jeffrey H. Parker May 1979 51 p refs
(PB80-106990; NYSSGP-AM-79-002; NOAA-79091301)
Copyright. Avail: NTIS HC A04/MF A01 CSCL 13B

The Lower Bay of New York Harbor is studied. The large, seasonally variable inflow of fresh water originating mainly from the Hudson River is examined. The effects of sewage effluent, also a significant source of fresh water is discussed. The distribution of water properties (salinity, nutrients, chlorophyll and the tides and tidal currents in the bay complex are studied.GRA

N80-16595# Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
ADSORPTION OF ENERGY-RELATED ORGANIC POLLUTANTS: A LITERATURE REVIEW Final Report, Jul. 1977 - Apr. 1978
K. A. Reinbold, J. J. Hassett, J. C. Means, and W. L. Banwat Aug. 1979 181 p refs
(Contract EPA-68-03-2555)
(PB80-105117; EPA-600/3-79-086) Avail: NTIS HC A02/MF A01 CSCL 07D

A literature review on sorption properties of sediments and energy-related organic pollutants is presented. Adsorption of organic compounds in general is discussed, and analytical methodology in soil thin layer chromatography and chemical analysis as applicable to measurement of sorption properties is summarized. The literature on the adsorption of energy-related organic pollutants is reviewed. Reported constants for the adsorption of organic compounds on several adsorbents are

tabulated, and factors that influence adsorption are discussed. GRA

N80-16596# *Resources for the Future, Inc., Washington, D. C.*
ENVIRONMENTAL SYSTEM STUDY ON THE DEVELOPMENT OF FOSSIL FUEL RESOURCES IN THE SOUTHWEST
James W. Sawyer May 1979 18 p refs
(Grant NSF AER-75-16163)
(PB-300526/1; NSF/RA-790117) Avail: NTIS HC A02/MF A01 CSCL 13B

Various outcomes of a project designed to study energy and synfuels technologies appropriate to the Southwest are described. The topics investigated include air pollution control for electric power plants in the Southwest, use of coal for electricity generation in California, and energy/transportation concepts, economics, and technologies. Navajo resource problems and economic considerations for the continued care of uranium mill sites are also discussed. GRA

N80-16597# National Center for Resource Recovery, Washington, D. C.
REFRACTORY PARTICLES IN CULLET RECOVERED FROM MUNICIPAL REFUSE
E. J. Duckett Mar. 1979 46 p refs
(Grant NSF APR-75-13864)
(PB-300523/8; NSF/RA-790144) Avail: NTIS HC A03/MF A01 CSCL 13B

The problem of refractory contamination as a potential barrier to the increased use of glass recovered from municipal solid waste is addressed. The causes of stones in container glass are reviewed along with the nature of the refractory particles found in cullet recovered from municipal solid waste, the behavior of refractory particles in the glass furnace, and some approaches available for either removing refractory particles from the recovered cullet or minimizing the effects of the refractory contaminants. GRA

N80-16598# Urban Inst., Washington, D.C.
BALANCING THE OBJECTIVES OF CLEAN AIR AND ECONOMIC GROWTH: REGULATED MARKETS IN EMISSION REDUCTIONS Interim Report
William A. Foskett, David M. Klaus, and John Haberle Jun. 1979 106 p refs
(Contract NBS-7-35822)
(PB-300835/6; NBS-GCR-ETIP-7962) Avail: NTIS HC A06/MF A01 CSCL 13B

Work in progress toward the evaluation of implementation and effects of market mechanisms for regulation of major stationary sources of air pollution is reported. Topics covered include the context in which market mechanisms are being introduced, the underlying logic of various market mechanisms and an operating prototype of a market mechanism, potential effects of market mechanisms on air pollution regulation, expectations associated with EPA's introduction of a prototype market mechanism offset policy, and the general direction of continuing work on this particular project. GRA

N80-16599# Environmental Monitoring and Support Lab., Research Triangle Park, N. C.
AIR QUALITY DATA FOR NONMETALLIC INORGANIC IONS: NH4+, NO3-, SO4= FROM THE NATIONAL AIR SUREVEILLANCE NETWORKS, 1976 Final Report
Donald H. Fair, Raymond C. Rhodes, E. Gardener Evans, John C. Puzak, and Frank E. Butler Jun. 1979 78 p
(PB-300458/7; EPA-600/4-79-041) Avail: NTIS HC A05/MF A01 CSCL 13B

The annual urban and nonurban concentrations of three nonmetallic inorganic ions, ammonium, nitrate, and sulfate - in suspended particulate matter are summarized. Concentration data are presented as cumulative frequency distributions. The arithmetic and geometric means and standard deviations are also reported. GRA

N80-16600# Tennessee Valley Authority, Chattanooga. Office of Natural Resources.
REMOTE SENSING OF SULFUR DIOXIDE EFFECTS ON VEGETATION - PHOTOMETRIC ANALYSIS OF AERIAL PHOTOGRAPHS
C. Daniel Sapp Jun. 1979 42 p refs
(PB-300460/3; TVA/ONR-79/01; EPA-600/7-79-138) Avail: NTIS HC A03/MF A01 CSCL 13B

Spectral reflectances were measured by tri band densitometry of aerial color infrared photographs of soybean Glycine mass fields that had been affected by sulfur dioxide (SO2) emissions from large, coal fired power plants in northwestern Alabama and western Tennessee. The photographs were photometrically calibrated. Results indicate that, at very light levels of foliar injury, the infrared to red reflectance ration decreased with increasing injury. This behavior was in accordance with theory. At moderate and severe levels of injury, the ratio increased with injury. The best indicator of crop yield was green band reflectance, but the red and infrared bands were nearly as good. The yield variable actually increased with the level of injury, apparently because of field to field variations in canopy density. GRA

N80-16601# Acurex Corp., Mountain View, Calif. Aerotherm Div.
ENVIRONMENTAL ASSESSMENT OF STATIONARY SOURCE NOx CONTROL TECHNOLOGIES Annual Report, Jun. 1977 - Jun. 1978
L. R. Waterland, K. J. Lim, K. G. Salvesen, R. M. Evans, E. G. Higginbotham, and H. B. Mason Jun. 1979 203 p refs
(Contract EPA-68-02-2160)
(PB-300469/4; EPA-600/7-79-147; AR-2) Avail: NTIS HC A10/MF A01 CSCL 13B

Program results are summarized for: (1) developing fuel consumption and NOx emission inventories; (2) field testing selected stationary combustion sources; (3) performing process engineering and environmental assessment studies of NOx controls applied to utility and industrial boilers and gas turbines; and (4) developing reactive air quality and source analysis models. Preliminary NOx control technology analysis for utility boilers indicates that off-stoichiometric combustion and low NOx burners (LNB) are the preferred techniques for both retrofit and new applications. For coal firing, overfire air operation and LNB are both cost effective; LNB is preferred for new wall-fired boilers. For oil and gas firing, staged combustion with burners out of service is recommended. GRA

N80-16602# Mitre Corp., McLean, Va.
A REVIEW OF STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES: PETROLEUM REFINERIES
Kris Barrett and Alan Goldfarb Jan. 1979 93 p refs
(Contract EPA-68-02-2526)
(PB-300480/1; EPA-450/3-79-008; MTR-7825) Avail: NTIS HC A05/MF A01 CSCL 13B

The current standards of performance for petroleum refineries are presented. The status of current applicable control technology is reviewed and the ability of refineries to meet the current standards is discussed. Compliance test results are analyzed and recommendations are made for possible modifications and additions to the standard, including future studies needed for unresolved issues. GRA

N80-16603# Army Armament Research and Development Command, Dover, N. J. Large Caliber Weapon Systems Lab.
EVALUATION OF THE ULTRAVIOLET-OZONE AND ULTRAVIOLET-OXIDANT TREATMENT OF PINK WATER Final Report, 6 Jun. 1976 - 30 Dec. 1977
Milton Roth and Joseph M. Murphy, Jr. Jul. 1979 41 p refs
(PB-300763/0; EPA-600/2-79-129) Avail: NTIS HC A03/MF A01 CSCL 13B

Pink water, a solution of trinitrotoluene (TNT) and other nitrobodies, is a major pollutant at ammunition plants engaged either in the manufacture of TNT or in the loading, assembly, and packing of bombs and shells. As an alternative to carbon adsorption for the treatment of pink water, two new methods are presented and evaluated. The first involves the use of ultraviolet (uv)-ozone and the second uses a uv-oxidant combination. Commercially available uv water purification units in conjunction with an oxidant such as hydrogen peroxide or Oxone, (a blend of potassium persulfate oxidants), were evaluated for their efficiency in treating pink water. Variables such as film depth, dilution, uv wavelength, and operation of the units in series rather than in parallel were examined. GRA

N80-16604# Resources for the Future, Inc., Washington, D. C.
ENVIRONMENTAL IMPACT AND ECONOMIC EVALUATION RESEARCH NEEDS FOR COASTAL AND MARINE RESOURCE MANAGEMENT Final Report
Elizabeth A. Wilman and John V. Krutilla May 1979 130 p refs
(PB-301208/5; NOAA-79083003) Avail: NTIS HC A07/MF A01 CSCL 13B

Analysis techniques required for the analysis of the benefits and costs of alternative coastal and marine resource use patterns are discussed in terms of adequately managing these resources. Quantitative modelling of natural production systems, toward increased precision in the estimation of the economic value of changes, including attention to the role of secondary economic influences on these values, and toward integrating all of this information into a decision making process which accommodates both the uncertainties involved and the decision maker's attitudes toward the risks involved is considered. GRA

N80-16605# Transportation Research Board, Washington, D.C.
IMPACT OF AIR QUALITY CONTROL MEASURES
Richard J. Zabinski, Gerald S. Cohen, David T. Hartgen, Michael R. Hoyles, George J. Scheuernstuhl et al 1979 37 p refs
(PB-301234/1; TRB/TRR-714; ISBN-0-309-02961-9; LC-79-607813) Avail: NTIS HC A03/MF A01; HC also available from Transportation Research Board, 2101 Constitution Ave., NW, Washington, D.C. 20418, HC $3.00 CSCL 13B

Contents: New York State response to the mandates of the clean air act; simplified method for evaluation of control strategies for revision of state implementation plans; analysis of air quality sensitivity to development pattern changes and growth levels; travel and emissions impacts of transportation control measures; and traffic-relations derived from urban driving schedule data. GRA

N80-16606# Ford Aerospace and Communications Corp., Newport Beach, Calif. Aeronutronic Div.
DEVELOPMENT OF AN SO2 MONITOR FOR MOBILE SOURCES Final Report, Oct. 1976 - Jan. 1978
Darrell E. Burch, Pamela S. Marrs Davila, Francis J. Gates, and John D. Pembrook Jul. 1979 52 p refs
(Contract EPA-68-02-2448)
(PB80-100472; EPA-600/2-79-121; U-6392) Avail: NTIS HC A04/MF A01 CSCL 14B

An instrument designed to monitor the concentration of SO2 in the exhaust of mobile sources is discussed. A pump and manifold assembly permit operation over a wide range of sample flow rates. The sample cell contains a multiple-pass optical system adjusted to 12 passes, giving a sample path length greater than 5 m. The rms noise level corresponds to approximately 0.05 ppm of SO2 when the electronic time constant is 1 sec. GRA

N80-16607# Ford Aerospace and Communications Corp., Newport Beach, Calif. Aeroneutronic Div.
DEVELOPMENT OF A MONITOR FOR HCN IN MOBILE SOURCE EMISSIONS Final Report, Apr. 1977 - Oct. 1978
Darrell E. Burch, Pamela S. Marrs Davila, Francis J. Gates, and John D. Pembrook Jun. 1979 44 p refs
(Contract EPA-68-02-2716)
(PB80-100514; U-6470; EPA-600/2-79-113) Avail: NTIS HC A03/MF A01 CSCL 13B

Three real-time monitors for measurement of HCN concentrations in mobile source emissions were designed, built, tested, and delivered to the Environmental Protection Agency. The important design parameters for these identical instruments were determined with a versatile gas-filter correlation spectrometer. The instruments employ a gas-filter cell to provide sensitivity to HCN while discriminating against other infrared active gases such as H2O, CO2, NH3 and many hydrocarbons that occur in mobile source emissions. The combined error after accounting for H2O interference for most dilute samples is less than 0.1 ppm HCN. GRA

N80-16608# Mathtech, Inc., Princeton, N. J.
AN ANALYSIS OF ALTERNATIVE POLICIES FOR ATTAINING AND MAINTAINING A SHORT-TERM NO2 STANDARD
Robert J. Anderson, Robert O. Reid, and Eugene D. Seskin 17 Sep. 1979 385 p refs Sponsored in part by Council on Environmental Quality, Washington, D.C., and Council on Economic Advisors, Washington, D.C.
(PB80-100530; EPA-230/3-79-011) Avail: NTIS HC A17/MF A01 CSCL 13B

The results of an analysis of alternative policies for implementing short term NO2 standards like those currently under consideration by EPA are summarized. Policy alternatives considered include an extension of current regulatory approaches to provide for control of stationary source emissions in state implementation plans, adoption of an emissions charge as a substitute for emissions limitation regulations, and adoption of a marketable permit program as a substitute for emissions limitation regulations. GRA

N80-16609# Environmental Monitoring and Support Lab., Research Triangle Park, N. C.
THE MAXIMUM LIKELIHOOD APPROACH TO PROBABILISTIC MODELING OF AIR QUALITY DATA Final Report
Terence Fitz-Simons and David M. Holland Jul. 1979 43 p refs
(PB80-104110; EPA-600/4-79-044) Avail: NTIS HC A03/MF A01 CSCL 12A

Software using maximum likelihood estimation to fit six probabilistic models is discussed. The program fits data to the normal distribution, the 3-parameter lognormal distribution, the 3-parameter Weibull distribution, the 3-parameter gamma distribution, the Johnson S(B) distribution, and the 4-parameter beta distribution. Six goodness-of-fit criteria are supplied and ranked by the program to aid in the selection of the most appropriate choice among the six models. The results of applying the program to several subsets of the Los Angeles Catalyst Study data base are presented. GRA

N80-16610# SRI International Corp., Menlo Park, Calif.
ATMOSPHERIC REACTION PRODUCTS OF ORGANIC COMPOUNDS Final Report
Dale G. Hendry and Richard A. Kenley Jun. 1979 90 p refs
(Contract EPA-68-01-5123)
(PB-301384/4; EPA-560/12-79-001) Avail: NTIS HC A05/MF A01 CSCL 04A

A procedure that predicts the products from reaction of compounds in the atmosphere was developed for use in unreasonable-risk evaluations that include assessing new chemicals for persistence and exposure in the environment in this procedure, the relative importance of the three dominant reaction pathways photolysis, reaction with OH radical, and reaction with ozone are first determined for each compound. Then the products from each pathway that play a major role for that compound are estimated using the techniques outlined in the methods. GRA

N80-16611# California Univ., Riverside. Statewide Air Pollution Research Center.
DETAILED CHARACTERIZATION OF GASEOUS AND SIZE RESOLVED PARTICULATE POLLUTANTS AT A SOUTH COAST AIR BASIN SMOG RECEPTOR SITE: LEVELS AND MODES OF FORMATION OF SULFATE, NITRATE AND ORGANIC PARTICULATES AND THEIR IMPLICATIONS FOR CONTROL STRATEGIES Final Report, Nov. 1975 - Jun. 1978
James N. Pitts, Jr. and Daniel Grosjean Jul. 1979 466 p refs
(PB-301294/5; ARB-R-5-384-79-100) Avail: NTIS HC A20/MF A01 CSCL 04A

A two-year research program was conducted to characterize gas phase pollutants, aerometric variables, visibility, aerosol elemental composition, and ambient levels and size distribution of particulate sulfate, nitrate, and ammonium at Riverside, a smog receptor site located at the eastern end of the California South Coast Air Basin. The data base generated was employed: (1) to establish diurnal and seasonal profiles for gaseous and particulate pollutants; (2) to calculate sulfur and nitrogen gas-particle distribution factors; (3) to correlate sulfate and nitrate levels with indicators of photochemical and aqueous aerosol formation mechanisms; and (4) to develop relationships between visibility impairment, aerosol concentration, and aerosol chemical composition. GRA

N80-16612# Technology Service Corp., Santa Monica, Calif.
WEEKEND/WEEKDAY DIFFERENCES IN OXIDANTS AND THEIR PRECURSORS Final Report
Yuji Horie, Joseph Cassmassi, Larry Lai, and Louis Gurtowski Mar. 1979 152 p refs
(Contract EPA-68-02-2595)
(PB-300479/3; EPA-450/4-79-013) Avail: NTIS HC A08/MF A01 CSCL 04A

Differences between weekend and weekday oxidant and oxidant precursor concentrations in the Northeastern United States are examined. Statistical tests were employed to assess whether any differences in daily maximum oxidant concentrations are significant. The analyses revealed that oxidant concentrations downwind of major urban areas tend to be lower on weekends. However, the reductions are not as large as those observed in precursor concentrations within the major urban areas. Reductions in weekend oxidant concentrations at locations within the major urban areas are not as great as those at downwind locations. GRA

N80-16613# Engineering-Science, Inc., McLean, Va.
INVENTORY OF SOURCES WITH EMISSIONS OF 25 TO 100 TONS PER YEAR SUBJECT TO ORGANIC MATERIAL REGULATIONS IN METROPOLITAN BOSTON AQCR Final Report
Jul. 1979 57 p
(Contract EPA-68-01-4146)
(PB-301242/4; EPA-901/9-79-009) Avail: NTIS HC A04/MF A01 CSCL 13B

An inventory of volatile organic compound emissions was conducted for sources in the Metropolitan Boston. Potential sources were identified and questionnaires were mailed to selected sources. The returned questionnaires were reviewed, and emissions were estimated. The results were quantified in an inventory of sources with the potential to emit between 25 and 100 tons/year. GRA

N80-16614# UTE Research Labs., Fort Duchesne, Utah.
THE ENVIRONMENTAL PROTECTION AGENCY FOUR CORNERS AMBIENT AIR MONITORING NETWORK
Jun. 1979 99 p refs
(Contract EPA-68-03-2345)
(PB80-103559; EPA-600/7-79-135) Avail: NTIS HC A05/MF A01 CSCL 13B

An air quality base line for the Four Corners area of Arizona, Colorado, New Mexico, and Utah was established. The base line was used in assessing the impact of the development of coal deposits and the operation of large, coal fired, electrical generating plants in the Four Corners area. A network of 29 monitoring stations was established to obtain data concerning the air quality in a predominantly rural area covering a multistate region. Results were evaluated in terms of the total suspended particulates present in the ambient air at each of the 29 monitoring stations on a seasonal basis. Results also were evaluated in terms of the validity of the sampling and analytical procedures. GRA

N80-16615# Northrop Services, Inc., Research Triangle Park, N. C.
CONTINUOUS AIR POLLUTION SOURCE MONITORING SYSTEMS
James A. Jahnke and G. J. Aldina Jun. 1979 253 p refs
(Contract EPA-68-03-2561)
(PB-300930/5; EPA-625/6-79-005) Avail: NTIS HC A12/MF A01 CSCL 14B

The detailed information necessary to develop a continuous emissions monitoring program at a stationary source facility is provided. Design and performance specifications, and monitoring and date reporting requirements are included. Extractive sampling techniques and in-situ methods are presented along with explanations of the analytical techniques used in marketed instrumentation. Methods for monitoring opacity, pollutant gases, and combustion gases, such as oxygen and carbon dioxide, are described. A detailed explanation of the EPA performance specification test is given along with an explanation of the statistical procedures used to evaluate newly installed systems. GRA

N80-16616# Little (Arthur D.), Inc., Cambridge, Mass.
EVALUATION OF STATIONARY SOURCE PARTICULATE MEASUREMENT METHODS. VOLUME 3: GAS TEMPERATURE CONTROL DURING METHOD 5 SAMPLING Interim Report, Oct. 1973 - Feb. 1977
Edward T. Peters and Jeffrey W. Adams Jun. 1979 32 p refs
(Contract EPA-68-02-0632)
(PB-300336/5; EPA-600/2-79-115-Vol-3) Avail: NTIS HC A03/MF A01 CSCL 14B

Changes in gas temperature were measured along the length of a Method 5 sampling train due to variations in stack gas temperature, sampling rate, filter box temperature and method for controlling the probe heating element. For each run condition, temperatures were measured in the stack, at ambient and at four internal and external positions along the sampling train at one minute intervals. Measurements were continued until the system was observed to reach a state of thermal equilibrium. The results demonstrate that gas temperatures cannot be predicted or controlled on the basis of externally measured temperatures. GRA

N80-16617# Tennessee Valley Authority, Muscle Shoals, Ala.
POTENTIAL PRODUCTION AND MARKETING OF FGD BYPRODUCT SULFUR AND SULFURIC ACID IN THE US (1983 PROJECTION) Final Report, Jun. 1976 - Dec. 1978
W. E. OBrien and W. L. Anders Apr. 1979 59 p refs
(PB-299205/5; ECDP-B-1; EPA-600/7-79-106) Avail: NTIS HC A04/MF A01 CSCL 13B

Least costs of compliance were calculated using comparisons of clean fuel with 50 cents and 70 cents/million Btu premiums, limestone scrubbing, and scrubbing systems with byproduct sulfur and H2SO4 production. Market potential of sales of sulfur burning H2SO4 plants was also determined. At the 50 cent premium, H2SO4 production was the least cost method at five plants, four of which had combined sales of 800,000 tons/yr. At the 70 cent premium, H2SO4 production was the least cost method at 26 plants, 7 of which had sales totalling 1.2 million tons. Other significant observations and results are reported. GRA

N80-16618# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
GUIDANCE FOR SELECTING TSP EPISODE MONITORING METHODS
George Manire 12 Feb. 1979 35 p refs
(PB-298459/9; EPA-450/4-79-007; OAQPS-1.2-114) Avail: NTIS HC A03/MF A01 CSCL 13B

The principles of operation are given for the two episode particulate monitoring methods which are modifications of the reference method. The procedures for establishing a site and season-specific relationship between the high volume method and particulate methods other than the modified reference methods are given. GRA

N80-16619# Industrial Environmental Research Lab., Research Triangle Park, N. C.
A STANDARD PROCEDURE FOR COST ANALYSIS OF POLLUTION CONTROL OPERATIONS. VOLUME 1: USER GUIDE Report, Oct. 1977 - May 1979
Vincent W. Uhl Jun. 1979 65 p refs 2 Vol.
(PB80-108038; EPA-600/8-79-018A-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 13B

A user guide for a standard procedure for the engineering cost analysis of pollution abatement operations and processes is presented. The procedure applies to projects in various economic sectors; private, regulated, and public. The models are consistent with cost evaluation practices in engineering economy and financial analysis. A recommended format is given that should not exceed eight pages when executed. The guidelines facilitate the choice of procedures open to the estimator and the establishment of factors to be used in the evaluation. GRA

N80-16620# Industrial Environmental Research Lab., Research Triangle Park, N. C.
A STANDARD PROCEDURE FOR COST ANALYSIS OF POLLUTION CONTROL OPERATIONS. VOLUME 2: APPENDICES Report, Oct. 1977 - May 1979

Vincent W. Uhl Jun. 1979 154 p refs 2 Vol.
(PB80-108046; EPA-600/8-79-018B-Vol-2) Avail: NTIS
HC A08/MF A01 CSCL 13B

The costs of pollution abatement operations and processes are analyzed for a flue gas desulfurization retrofit facility and a chloralysis plant. Background information is provided on capital investment and annual expense estimation, discrete and continuous interest factors, measures of merit, cost indices and inflation factors, rates of interest and return, and methods of reliability assessment. K.L.

N80-16621# Mathtech, Inc., Princeton, N. J.
EVALUATION OF THE ENVIRONMENTAL EFFECTS OF WESTERN SURFACE COAL MINING. VOLUME 2: MINE INVENTORY Final Report
William Kelly Feb. 1979 207 p
(Contract EPA-68-03-2226)
(PB-301249/9; EPA-600/7-79-034) Avail: NTIS
HC A10/MF A01 CSCL 08I

A tabular summary of general information is presented for 37 surface coal mines active in the western United States during 1975 and for seven additional mines that were under development in that year. In total, 44 mines in the following states are included: Arizona, Colorado, Montana, New Mexico, North Dakota, and Wyoming. Types of information presented include production information; mine life, employment, and disturbed acreage; coal seam characteristics; reclamation practices; overburden characteristics, and stripping equipment types and capacities. GRA

N80-16622# Skelly and Loy, Harrisburg, Pa.
ENVIRONMENTAL ASSESSMENT OF SURFACE MINING METHODS: HEAD-OF-HOLLOW FILL AND MOUNTAINTOP REMOVAL Interim Report, Nov. 1975 - Jan. 1977
John D. Robins and John C. Hutchins Jul. 1979 223 p refs
(Contract EPA-68-03-2356)
(PB-300540/2; EPA-600/7-79-062) Avail: NTIS
HC A10/MF A01 CSCL 08I

The environmental impact of the mining and reclamation techniques employed in West Virginia and Kentucky mountaintop removal and head-of-hollow fill sites was investigated. GRA

N80-16623# General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.
GROUNDWATER QUALITY MONITORING OF WESTERN OIL SHALE DEVELOPMENT. IDENTIFICATION AND PRIORITY RANKING OF POTENTIAL POLLUTION SOURCES
Gwenton C. Slawson, Jr. Jan. 1979 241 p refs
(Contract EPA-68-03-2449)
(PB-300536/0; GE77TMP-51; EPA-600/7-79-023) Avail: NTIS HC A11/MF A01 CSCL 08I

Oil shale operations such as those proposed for eastern Utah are assessed as potential pollution sources. A priority ranking of pollutants is presented based on the magnitude of the source and the toxicity, persistence, and mobility of the pollutants. K.L.

N80-16624# Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla.
ICHTHYOPLANKTON ABUNDANCE AND DIVERSITY IN THE EASTERN GULF OF MEXICO Final Report
Edward D. Houde, James C. Leak, Catharina E. Dowd, Steven A. Berkeley, and William J. Richards Jun. 1979 581 p refs
Prepared in cooperation with National Marine Fisheries Service, Miami, Fla.
(Contract DI-AA550-CT7-28)
(PB-299839/1; BLM/YM/ES-79/10) Avail: NTIS
HC A25/MF A01 CSCL 13B

An ichthyoplankton survey in the eastern Gulf of Mexico was carried out to determine the kinds and abundances of larval fishes, their distribution and diversity, and the relationship of their occurrence to environmental factors. Important baseline data on the early life stages of fishes in the Gulf of Mexico are presented. Effects of environmental factors on ichthyoplankton abundances are not clearly demonstrated but the modes and ranges of surface temperature, surface salinities and station depths where common species occurred are clearly defined. Positive affinities of some species with water of Loop Current origin, when it intruded into coastal areas, are demonstrated for several species. GRA

N80-16625# Mitre Corp., McLean, Va. METREK Div.
OUTER CONTINENTAL SHELF ENVIRONMENT MONITORING CONCERNS Final Report
J. Slaughter Jul. 1979 78 p refs
(Contract EQ8AC020)
(PB-299861/5; MTR-79W00192) Avail: NTIS
HC A05/MF A01 CSCL 13B

Information is presented on existing and proposed Federal environmental monitoring programs applicable to oil and gas exploration, development, and production on the outer continental shelves (OCS). An analysis of the relevance of these programs to the needs of state and local governments affected by OCS activities is given. Discussion of significant unmet monitoring needs is included. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N80-16626 Princeton Univ., N. J.
GEOLOGY OF PRECAMBRIAN METAMORPHIC ROCKS OF THE TRUCHAS PEAKS AREA, NORTH-CENTRAL NEW MEXICO Ph.D. Thesis
Jeffrey Arthur Grambling 1979 269 p
Avail: Univ. Microfilms Order No. 7928471

Detailed mapping in the Trucha Peaks region of north-central New Mexico delineates a deformed and metamorphosed Proterozoic terrane which contains an apparent equilibrium occurrence of the Al_2SiO_5 triple point. Various dehydration equilibria define the pressure and temperature of crystallization of assemblages which include coexisting kyanite, andalusite, and sillimanite. Geologic evidence, consisting of corresponding lithologies, fold axes, and isograds, suggests that rocks of the Truchas and Picuris Ranges were once adjacent, forming part of an extensive quartzite terrane which has been split apart by 37 km of right lateral motion along the Picuris-Pecos fault. The quartzitic Truchas Group forms part of a Proterozoic greenstone-quartzite association. Minor amounts of metavolcanic materials, which probably originated in the greenstone belt and lapped onto the quartzite platform, are interstratified with massive quartzite near Truchas Peak. These relationships indicate that the greenstone belt and quartzite platform existed side by side.
Dissert. Abstr.

N80-16627 Stanford Univ., Calif.
EVOLUTION OF THE LATE PENNSYLVANIAN-EARLY PERMIAN WESTERN OQUIRRH BASIN, UTAH Ph.D. Thesis
Teresa Eileen Jordan 1979 287 p
Avail: Univ. Microfilms Order No. 8001948

The topographic and structural nature of the Oquirrh basin and the depositional mechanisms responsible for the strata are discussed. The sedimentary and structural history of the basin in the Late Pennsylvanian and Early Permian is emphasized. Field study of the western upper Oquirrh Group focused upon measurement, description, and sampling of six detailed sections and reconnaissance study of adjacent areas. The fourteen lithofacies present are dominated by subarkosic arenite and clastic limestone. The distributions of trace fossils and body fossils and paleoecologic interpretations reveal a gradient of water depths spatially and through time. Fusulinid biostratigraphy permits construction of an accurate time framework in which to examine lithologic and paleoecologic trends. Dissert. Abstr.

N80-16628 West Virginia Univ., Morgantown.
SUBSURFACE STRATIGRAPHY OF THE MIDDLE AND UPPER DEVONIAN CLASTIC SEQUENCE IN SOUTHERN WEST VIRGINIA AND ITS RELATION TO GAS PRODUCTION Ph.D. Thesis
Donald Wade Neal 1979 305 p

Avail: Univ. Microfilms Order No. 8000226

A stratigraphic framework for the Middle and Upper Devonian clastic sequence in the subsurface of southern West Virginia was established using gamma-ray logs, drillers' logs, and sample descriptions. The Devonian shale within the study area is submature with respect to hydrocarbon generation yet produces a high quality gas. An interconnected fracture system is postulated to be the reservoir in which gas accumulates where there is the complimentary presence of both thick intervals of black shale and broad flexures which produce fractures. New areas of potential shale gas exploration for both the Huron Member of the Ohio Shale and the Rhinestreet Shale-Marcellus Shale interval are located east of the Warfield Anticline in Boone, Logan, Mingo, McDowell, Wyoming, and Raleigh Counties, West Virginia.

Dissert. Abstr.

N80-16629 Pennsylvania State Univ., University Park.

STRATIGRAPHY AND SEDIMENTOLOGY OF THE UPPER DEVONIAN CATSKILL AND UPPERMOST TRIMMERS ROCK FORMATIONS IN CENTRAL PENNSYLVANIA Ph.D. Thesis

Victor David Kh. Rahmanian 1979 396 p

Avail: Univ. Microfilms Order No. 7922333

Stratigraphy and the depositional history of formations in central and southcentral Pennsylvania are investigated. The uppermost parts of the Trimmers Rock formation and the Catskill formation are described. Paleoenvironmental synthesis of the facies relationships indicates that the Upper Devonian sedimentary units in the area are the products of deposition in a complex prograding deltaic-intradeltaic coast and its associated higher alluvial-coastal plain. The main sediment input area, located in central Pennsylvania, was characterized by an active river system in the alluvial plain which graded down slope into a tidally dominated delta along the shoreline. The intradeltaic regions to the north and south were characterized by broad tidal flats which developed both along the nonconfined coast and the ice side or behind barrier island systems. The results of the petrographic analysis of the sandstone samples are discussed. Dissert. Abstr.

N80-16630 Princeton Univ., N. J.

GEOLOGY OF THE ACARIGUA AREA, VENEZUELA Ph.D. Thesis

Grant Michael Skerlec 1979 301 p

Avail: Univ. Microfilms Order No. 7928488

In the Acarigua area the Caribbean Mountains consist of three tectonic belts that are continuations of similar belts found farther to the east. The western Caribbean Mountains contain a series of low-angle thrust faults that place the metasediments of the Cordillera de la Costa Belt over the lower grade metasediments of the Central Belt, which is thrust in turn over the Rio Guache Formation. The offset of these basal thrust faults by a complex series of high-angle faults suggests that the maximum possible amount of right-lateral strike-slip displacement along the Bocono fault is 50 kilometers and that no strike-slip displacement at all need have occurred. Isopach data for Cretaceous platform sediments suggest that the western limit of thrust faulting was caused by a thinning of decollement horizons along a pronounced northsouth jog in the Venezuelan continental margin. Dissert. Abstr.

N80-16631 Stanford Univ., Calif.

QUATERNARY STREAM TERRACES IN THE NORTHWESTERN SACRAMENTO VALLEY, GLENN, TEHAMA, AND SHASTA COUNTIES, CALIFORNIA Ph.D. Thesis

William Clinton Steele 1979 270 p

Avail: Univ. Microfilms Order No. 8002018

Stream terraces in Glenn, Tehama, and Shasta Counties, in the northwestern Sacramento Valley, California, were mapped and analyzed quantitatively. The morphology and pedology of the terraces were delineated in order to develop quantitative methods for identification of the different terrace levels and to determine their possible origin and age relationships.

Dissert. Abstr.

N80-16632 Colorado State Univ., Fort Collins.

THE YALLAHS FAN DELTA, SOUTHEASTERN JAMAICA: A DEPOSITIONAL MODEL FOR ACTIVE TECTONIC COASTLINES Ph.D. Thesis

William Albert Wescott 1979 189 p

Avail: Univ. Microfilms Order No. 7928557

The vertical and lateral succession of specific subaerial, transitional, and submarine evironments associated with the Yallahs fan delta system provides the data for the development of a stratigraphic model for truncated, coarse-grained, humid region fans that build directly onto relatively steep submarine slopes. This model should prove useful in the recognition of fan delta deposits in the rock record and for the paleogeographic reconstruction of ancient, tectonically active continental and island-arc plate margins. It may also serve as a valuable tool in the search for economic deposits and fossil fuels. Dissert. Abstr.

N80-16633 Iowa Univ., Iowa City.

PRELIMINARY GEOLOGIC APPRAISAL AND ECONOMIC ASPECTS OF THE PRECAMBRIAN BASEMENT OF IOWA Ph.D. Thesis

Abdolmajid Yaghubpur 1979 397 p

Avail: Univ. Microfilms Order No. 7928633

Precambrian samples from 85 wells, 10 isotopic age determinations, local and regional geophysical data, plus information from surrounding states permit identification of 14 rock units assigned to the Penokean, Eastern Iowa, and Keweenawan Precambrian Provinces. In the Penokean Province, a taconite body, located about 3 miles west of Matlock, Sioux County, is flanked by serpentinite that contains traces of chromite and nickel sulfide. Also, layered-type orthomagmatic titaniferous magnetite deposits are located at Osborne, Clayton County, and Spencer, Clay County. Associated with the Spencer deposit are minor amounts of pyrrhotite and traces of chalcopyrite, whereas vanadium in titanomagnetite is common to both. Several other mineral resource occurrences may exist, particularly stratiform copper deposits in Keweenawan Terrane and uncomformity-type uranium deposits related to the basal Sioux Quartzite contact.

Dissert. Abstr.

N80-16634 Stanford Univ., Calif.

GEOLOGY AND SKARN ORE MINERALIZATION OF THE YEONHWA-ULCHIN ZINC-LEAD MINING DISTRICT, SOUTHEASTERN TAEBAEGSAN REGION, KOREA Ph.D. Thesis

Suckew Yun 1979 409 p

Avail: Univ. Microfilms Order No. 8002041

The zinc-lead skarn deposits of the Yeonhwa-Ulchin mining district were investigated. The structural pattern of the district, the development patterns of ore bodies at each of the mines, including ore minerals in all deposits were examined along with the mineralogical properties of ore and gangue minerals. Results are presented. Dissert. Abstr.

N80-16635 Stanford Univ., Calif.

PLATE MOTIONS RELATIVE TO THE PALEOMAGNETIC AXIS AND THE LOWER MANTLE Ph.D. Thesis

Richard Garth Gordon 1979 151 p

Avail: Univ. Microfilms Order No. 8001927

The estimation of absolute plate motions is extended to the geologic past and used to test models of absolute motions and plate driving forces. A method for estimating the absolute plate velocity of an individual plate from its ridge and trench boundary is proposed along with a technique for the estimation of the minimum rms velocities relative to the paleomagnetic axis of three major continents since the Devonian. A method is developed using nonlinear least squares and mximum likelihood statistics and applied to the Campanian paleomagnetic data available from the Pacific plate. Paleomagnetic data from India and Australia, the apparent polar wander path of the Pacific plate, and the seafloor spreading histories of the Indian Ocean and southwest Pacific Ocean are used to demonstrate that there was large tertiary relative motion between east and west Antarctica.

Dissert. Abstr.

N80-16636 California Inst. of Tech., Pasadena.

PHYSICS OF MANTLE AND CORE MINERALS Ph.D. Thesis

Raymond Jeanloz 1980 412 p

Avail: Univ. Microfilms Order No. 8002588

Shock wave equation of state data are used to evaluate theoretically calculated properties of the earth's core. Hugoniot

data for MgO and SiO2 suggest that the core is a major heat source for the mantle and that a barrier to convection occurs in the lower mantle. This inference is consistent with shock wave data for CaO which show that calcium could be substantially enriched in the lower mantle. Data for bronzite, olivines, and pyroxenes are consistent with static high pressure results, but suggest the occurrence of post-perovskite phases and also provide evidence for nonequilibrium effects. Although the bulk properties measured under shock are consistent with the attainment of thermodynamic equilibrium, these properties apparently represent highly transient and nonequilibrium states. Dissert. Abstr.

N80-16637 California Univ., Berkeley.
INVESTIGATION OF SEISMIC SOURCES BY THE LINEAR INVERSION OF SEISMOGRAMS Ph.D. Thesis
Brian William Stump 1979 279 p
Avail: Univ. Microfilms Order No. 8000528

A method was developed allowing the direct inversion of seismograms to obtain an estimate of the seismic point source, as characterized by its equivalent first degree force moment tensor. The problem was shown to be linear in both the frequency and time domains and least squares methods were used to estimate the source mechanism. In the synthetic tests that were run, several possible uses of the method were investigated. With a satisfactory station distribution, the source mechanism was recovered using complete seismograms from three component stations or several P arrivals on vertical components. The method was useful in distinguishing multiple events including explosions. The errors of the fits were determined and yield information such as the bandwidth of useful data in the frequency domain and error estimates for fault plane solutions in the time domain fits. Dissert. Abstr.

N80-16638 Stanford Univ., Calif.
PETROLOGY AND STRATIGRAPHY OF PALEOGENE NONMARINE SANDSTONES, CASCADE RANGE, WASHINGTON Ph.D. Thesis
Virgil Allen Frizzell, Jr. 1979 169 p
Avail: Univ. Microfilms Order No. 8001919

A compositional and stratigraphic analysis of the Cascade range north of 47 deg latitude is presented. Results show a range composition of probable Paleozoic and Mesozoic metamorphic rocks and Mesozoic and Tertiary plutonic rocks. Several Paleogene nonmarine arkosic sandstone units fringe and in part occur within the complex crystalline core. The various formations are all composed predominantly of fine- to medium-grained sandstones with lesser amounts of interbedded shale, conglomerate, and coal. Compositionally, the units are predominantly either feldspathic or litho-feldspathic subquartzose sandstones. Modal analysis is performed on samples from the various sedimentary units to establish petrologic compositions, and to provide data with which to compare the different units and discuss clast provenance and tectonic regimen. Dissert. Abstr.

N80-16639 Stanford Univ., Calif.
GEOPHYSICS OF THE GEYSERS GEOTHERMAL FIELD NORTHERN CALIFORNIA Ph.D. Thesis
Roger Patrick Denlinger 1979 96 p
Avail: Univ. Microfilms Order No. 8001901

An analysis of detailed gravity, seismic and geodetic information was combined with reservoir engineering studies to place severe constraints on the Geysers vapor dominated geothermal system. An extension of the Mt. Hannah gravity low was found to underlie The Geysers steam system. The negative gravity anomaly associated with the steam system was modeled. A deep low density body underlying the steam system was used to represent part of the heat source and deep seismic reflections observed from NE dipping horizons between 4 and 5 km were used to represent the major tectonic boundaries in the Franciscan formation. Dissert. Abstr.

N80-16640 Stanford Univ., Calif.
THE EFFECTS OF PORE FLUIDS AND FRICTIONAL SLIDING ON SEISMIC ATTENUATION Ph.D. Thesis
Kenneth William Winkler 1979 195 p
Avail: Univ. Microfilms Order No. 8002039

An experimental approach using bar resonance technique was adopted. One meter long bars of rock were vibrated in torsional and extensional modes at frequencies between about 500 and 1700 hertz. Confining pressure, pore pressure, degree of saturation and strain amplitude were all varied. Results indicate that pore fluids dominate seismic attenuation under the conditions of the experiments, conditions which are in many ways representative of the Earth's upper crust. In dry sandstone both P waves and shear waves show relatively small amounts of attenuation. Partial saturation (to about 95 percent) caused attenuation to increase by a factor of two to four and results in P waves being attenuated more strongly than shear waves. The transition to total saturation resulted in maximum shear wave attenuation, but caused a significant reduction in P wave attenuation. In fully saturated rock, shear waves were attenuated more strongly than P waves. Dissert. Abstr.

N80-16641 California Univ., Los Angeles.
STABILITY OF A TURBULENT LAYER CLOUD WITHIN THE PLANETARY BOUNDARY LAYER Ph.D. Thesis
Chin-Hoh Moeng 1979 161 p
Avail: Univ. Microfilms Order No. 8001387

A model for numerical simulations of a stratus cloud layer is constructed by combining a second-order closure turbulent transfer model with a thermal radiative transfer model." The turbulence-radiation combined model is applied to a horizontally uniform one dimensional case and a horizontally nonuniform two dimensional case. In the latter the dynamics of mesoscale circulations have also been incorporated. The two dimensional simulation reproduces the layer cloud instability where the sea surface temperature is high and the large-scale subsidence is weak. The simulated instability process has been analyzed in view of Randall's instability criterion, the eddy kinetic energy budget, and evaporative cooling near the cloud top. The growth rates of the instability are obtained using the linearized perturbation equations. Dissert. Abstr.

N80-16642 Wisconsin Univ. - Madison.
A CASE STUDY OF HEIGHT AND TEMPERATURE ANALYSES DERIVED FROM NIMBUS-6 SATELLITE SOUNDINGS ON A FINE MESH MODEL GRID Ph.D. Thesis
Thomas Lee Koehler 1979 204 p
Avail: Univ. Microfilms Order No. 7927181

Two sets of temperature profiles derived from the same set of Nimbus-6 radiance measurements were evaluated. The first set had an average horizontal spacing of about 300 km and was employed extensively in other impact studies. The second had a finer resolution, roughly a 150 km spacing. Several means of comparison are presented, including visual and statistical comparisons of the temperature and height fields, and comparisons of dynamic and energetic parameters derived from them. The results indicate that Nimbus-6 soundings were able to correctly position the major trough and ridge positions, but underestimate gradients in the analyses. The soundings exhibited a consistent warm bias, with maximum root mean squared errors of more than 3 C near the surface and tropopause. No advantage was found in using the satellite soundings with the finer resolution, mainly because of their higher noise level. Manual screening of the normal resolution soundings provided only minor improvements. Dissert. Abstr.

N80-16643 Maryland Univ., College Park.
METRIC-CONNECTION THEORIES OF GRAVITY Ph.D. Thesis
Phillip Barry Yasskin 1979 317 p
Avail: Univ. Microfilms Order No. 8002074

Using a method similar to that used by Papapetrou and Dixon in the context of metric theories, propagation equations for a body's momentum and and angular momentum are derived. These show that elementary particle spins feel the torsion but orbital angular momentum does not. Results indicate that in a metric theory, spin and orbital angular momentum propagate in the same way. A two tangent space formalism which gives geometrical insight into the presence of two connections was developed. The Christoffel connection acted on one of the tangent spaces (called the external tangent space) while the full connection acted on the other tangent space (called the internal tangent space). The isomorphism between the two tangent spaces (called the soldering isomorphism) corresponded to the orthonormal frame in the usual one tangent space formalism. Its covariant derivative

was the defect tensor which was the difference between the full connection and the Christoffel connection. Dissert. Abstr.

N80-16644 Iowa Univ., Iowa City.
ON THE GENERATION OF AURORAL KILOMETRIC RADIATION Ph.D. Thesis
James Lauer Green 1979 157 p
Avail: Univ. Microfilms Order No. 7928581

Simultaneous observations between the Hawkeye spacecraft in the AKR emission cone and the low altitude polar orbiting spacecraft Triad and AE-D reveal that auroral kilometric radiation (AKR) is correlated with a variety of auroral particle precipitation in the evening to midnight local time sector. It is found that as the AKR intensity increases so does the integrated current sheet intensity of auroral zone field aligned currents observed by Triad increase from a survey of 257 simultaneous observations. Statistically, the linear correlation coefficient between the log of the AKR power flux and the log of the current sheet intensity is 0.57. The results presented indicate that kilometric radiation is generated by inverted-V electron distribution functions in a direct coupling mechanism between particle energy and R-X mode electromagnetic waves. Dissert. Abstr.

N80-16645# Finnish Meteorological Inst., Helsinki.
MAGNETIC RESULTS FROM NURMIJAERVI GEOPHYSICAL OBSERVATORY, 1978
1979 35 p
(ISBN-951-697-125-3; ISSN-0071-5212) Avail: NTIS HC A03/MF A01

Observed magnetic results for 1978 are presented in tabular form. The data include declination, horizontal intensity, vertical intensity, diurnal variation, monthly means, and K-indices. R.E.S.

N80-16646# Institute for Defense Analyses, Arlington, Va.
A CATALOG OF PERTURBING INFLUENCES ON STRATOSPHERIC OZONE, 1955-1975 Final Report, 15 Apr. - 15 Oct. 1978
E. Bauer Sep. 1978 200 p refs
(Contract DOT-FA77WA-3965)
(AD-A063650; P-1340; FAA-EQ-78-20) Avail: NTIS HC A09/MF A01 CSCL 04A

A list of all major time varying perturbations over a 20 year time frame is presented. Detailed consideration is given to the following: atmospheric nuclear explosions; galactic cosmic rays; solar proton events; relativistic (or energetic) electron precipitation, major volcanic eruptions; halocarbons (fluoro-, chloro-, and bromocarbons); fertilizer manufacture; and other industrial nitrogen fixation. For sources injected directly into the stratosphere, the time, altitude, and latitude dependent source strengths are listed, while for the ground based sources the time and latitude dependent production and atmospheric emission rates are given. Time variations of solar ultraviolet and of stratospheric temperature, and possible variations in stratospheric dynamics are also discussed. R.C.T.

N80-16647# Ionospheric Prediction Service, Darlinghurst (Australia).
***IONOSPHERIC STORM EFFECTS ON MAXIMUM USABLE* FREQUENCIES ON CIRCUITS AROUND AUSTRALIA**
L. F. McNamara Apr. 1977 99 p
(IPS-R-35) Avail: NTIS HC A05/MF A01

The effects of ionospheric storms on the maximum usable frequency (MUF) for circuits around Australia were investigated. The results are discussed in terms of the ionospheric parameter foF2, which is directly related to the MUF. Tables are given which list the probability of a storm effect as a function of latitude, season, and local time. R.E.S.

N80-16648# *Ionospheric Prediction Service, Darlinghurst (Australia).*
ANALYSIS OF NUMERICAL IONOGRAMS. 3: THE VALLEY *PROGRAM*
A. K. Paul, T. L. Gulyaeva, L. F. McNamara, J. E. Titheridge, and J. W. Wright Oct. 1978 24 p refs
(IPS-X8) Avail: NTIS HC A02/MF A01

Accurate numerical ionograms corresponding to daytime electron density profiles containing an E-F valley have been analyzed by four different methods. It is found that the methods of analysis due to Paul and Titheridge can determine the height of the F layer just above the valley to within a few km. The method used by Wright, on the other hand, leads to underestimates of this height by about 10-20 km. For most profiles, Gulyaeva's method yields errors of 5-10 km, but in some cases overestimates of up to 30 km can occur. Author

N80-16649*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
THE INFLUENCE OF VARIATIONS IN OZONE CONCENTRATION ON THE TEMPERATURE REGIME OF THE ATMOSPHERE
L. R. Rakipova Jun. 1979 6 p refs Transl. into ENGLISH from Transactions (USSR), Leningrad, 1974 p 359-361 Presented at the 1st All-Union Conf., Moscow, 30 Oct. - 1 Nov. 1972 Original language document previously announced as A74-37733 Transl. by SCITRAN, box 5456, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75350) Avail: NTIS HC A02/MF A01 CSCL 04A

The results of a study of the effects provided by changes in the concentration of atmospheric ozone on the mean temperatures of the troposphere and lower stratosphere are presented. It was found that ozone must be considered no less important in producing climatic changes than is CO2. R.E.S.

N80-16650*# Earthquake Engineering Systems, Inc., San Francisco, Calif.
POTENTIAL UTILIZATION OF THE NASA/GEORGE C. MARSHALL SPACE FLIGHT CENTER IN EARTHQUAKE ENGINEERING RESEARCH
Roger E. Scholl, ed. Dec. 1979 234 p refs Sponsored in part by NSF
(Contract NAS8-33220)
(NASA-CR-161371) Avail: NTIS HC A11/MF A01 CSCL 08K

Earthquake engineering research capabilities of the National Aeronautics and Space Administration (NASA) facilities at George C. Marshall Space Flight Center (MSFC), Alabama, were evaluated. The results indicate that the NASA/MSFC facilities and supporting capabilities offer unique opportunities for conducting earthquake engineering research. Specific features that are particularly attractive for large scale static and dynamic testing of natural and man-made structures include the following: large physical dimensions of buildings and test bays; high loading capacity; wide range and large number of test equipment and instrumentation devices; multichannel data acquisition and processing systems; technical expertise for conducting large-scale static and dynamic testing; sophisticated techniques for systems dynamics analysis, simulation, and control; and capability for managing large-size and technologically complex programs. Potential uses of the facilities for near and long term test programs to supplement current earthquake research activities are suggested. DOE

N80-16651*# *Jet Propulsion Lab., California Inst. of Tech., Pasadena.*
PROCESSING OF MULTISPECTRAL THERMAL IR DATA *FOR GEOLOGIC APPLICATIONS*
Anne B. Kahle, Daryl P. Madura, and James M. Soha 15 Nov. 1979 43 p *refs Original contains color illustrations*
(Contract NAS7-100)
(NASA-CR-162682; JPL-PUB-79-89) Avail: NTIS *HC A03/MF A01 CSCL 08G*

Multispectral thermal IR data were acquired with a 24-channel scanner flown in an aircraft over the E. Tintic Utah mining district. *These digital image data required extensive computer processing* in order to put the information into a format useful for a geologic photointerpreter. Simple enhancement procedures were not sufficient to reveal the total information content because the data were highly correlated in all channels. The data were shown to be dominated by temperature variations across the scene, while the much more subtle spectral variations between the different rock types were of interest. The image processing techniques employed to analyze these data are described. J.M.S.

N80-16652# California Univ., Berkeley. Earth Sciences Div.
VERTICAL MOVEMENT ALONG THE CERRO PRIETO TRANSFORM FAULT, BAJA CALIFORNIA, MEXICO - A

MECHANISM FOR GEOTHERMAL ENERGY RENEWAL

S. VonderHaar, J. E. Noble, and I. Puente Cruz Mar. 1979 8 p refs *Prepared jointly by Comision Federal de Electricidad, Mexico City*

(Contract W-7405-eng-48)

(LBL-8905) *Avail: NTIS HC A02/MF A01*

Data from 53 geothermal wells to depths of 1 to 3 km on either side of the right-lateral Cerro Prieto fault, as well as *geophysical data, indicate vertical displacements of this fault of* 400 to 600 m. This episodic vertical movement has offset deltaic sandstone reservoirs that are primarily at 1200 m and 1800 m *depth and contain 250 to 345 C water. A major fracture system* for convective fluid movement has been thus maintained, with production at 150 MW. DOE

N80-16653# Brookhaven National Lab., Upton, N. Y.

NORMAL INCIDENT SOLAR RADIATION MEASUREMENTS AT UPTON, NEW YORK

J. G. Cottingham 24 Oct. 1978 15 p

(Contract EY-76-C-02-0016)

(BNL-50939) *Avail: NTIS HC A02/MF A01*

Normal incident solar energy measurements made at Upton, L.I., New York are reported and analyzed relative to the total energy received on a horizontal surface. A method for computing normal incident solar radiation is developed and used to study long term variations in this energy source at Upton and to estimate *average values for other east coast locations.* DOE

N80-16654# *Iowa State Univ. of Science and Technology, Ames.* Engineering Research Inst.

CHEMICAL COMPACTION AIDS FOR FINE-GRAINED SOILS, VOLUME 1 ***Final Report***

James M. Hoover and Richard L. Handy Jun. 1979 162 p refs

(Contract DOT-FH-11-8135)

(PB-301115/2; FHWA/RD-79/63-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 08M

An extensive review of appropriate subject literature and a pilot laboratory moisture-density-strength study of twenty chemicals with eight soils of varying origin and mineralogy are *presented. Also included are a theoretical discussion of possible* mechanisms of chemical compaction aids, properties of the twenty-six soils used in the total investigation (Phase I and Phase *II), and data from supplemental tests designed to improve* understanding of the influences of the chemicals on fine-grained soils. GRA

N80-16655# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Civil Engineering.

PROBABILISTIC SEISMIC STABILITY ANALYSIS: A CASE STUDY

D. A-Grivas and G. Nadeau Jul. 1979 42 p refs

(Grant NSF ENV-77-16185)

(PB-301291/1; NSF/RA-790131; CE-79-1) Avail: NTIS HC A03/MF A01 CSCL 08K

An application of a probabilistic seismic stability analysis to a natural slope located near Slingerlands, New York, is given. *The safety of the slope is measured in terms of its probability* of failure rather than the customary factor of safety. Three types of earthquake sources are investigated, namely, a point, a line *and an area source, and the dependence on significant seismic* parameters of the probability of failure of the slope is examined. On the basis of the results obtained, it is concluded that the *present model is useful in assessing the reliability of soil slopes* under both static and seismic conditions and the probability of failure of a soil is greatly affected by the type of the earthquake *source involved and by the values of seismic parameters that* are associated with it. GRA

N80-16656# *Rensselaer Polytechnic Inst., Troy, N. Y.* Dept. of Civil Engineering.

A PROBABILISTIC MODEL FOR SEISMIC SLOPE STABILITY ANALYSIS

D. A-Grivas, J. Howland, and P. Tolcser Jun. 1979 98 p refs

(Grant NSF ENV-77-16185)

(PB-301369/5; NSF/RA-790130; CE-78-5) Avail: NTIS HC A05/MF A01 CSCL 08K

A model for probabilistic stability analysis of earth slopes under earthquake loading is presented. Significant uncertainties *associated with conventional pseudo-static methods of seismic* stability analysis are recognized and probabilistic tools are introduced for their description and amelioration. The proposed *method of analysis accounts for: the variability of material strength* parameters; the uncertainty in the exact location of potential failure surfaces; and the uncertainty in the value of the maximum *slope acceleration during an earthquake.* GRA

N80-16657# National Oceanic and Atmospheric Administration, Boulder, Colo. *World Data Center A for Solar-Terrestrial* Physics.

AURORAL ELECTROJET MAGNETIC ACTIVITY INDICES AE (11-12) FOR JANUARY - JUNE 1975

J. H. Allen, C. C. Abston, J. E. Salazar, and J. A. McKinnon Aug. 1979 115 p refs

(PB80-106974; UAG-73; NOAA-79092406) Avail: NTIS HC A06/MF A01 CSCL 04A

The Auroral Electrojet index (AE) is discussed and a brief *description is given of the derivation of 11-12 station 1.0 min* AE indexes for January - June 1975. Tables are given of hourly *averager indexes for each day, of the stations making the main contribution to the hourly indexes, and of the average monthly* quiet-time level of horizontal fields (H) at each magnetic observatory. Graphs of the index variations are included for each *day of the first half of 1975 and for the frequency and amplitude* of extreme variations at each site. GRA

N80-16658# California Univ., Richmond. Earthquake Engineering Research Center.

SOIL STRUCTURE INTERACTION IN DIFFERENT SEISMIC ENVIRONMENTS

Alberto Gomez-Masso (Woodward-Clyde Consultants, San Francisco), John Lysmer (Calif. Univ. Berkeley), Jian-Chu Chen (Calif. Univ. Lawrence Livermore Lab., Livermore), and H. Bolton Seed (Calif. Univ., Berkeley) Aug. 1979 58 p refs

(Contract NSF ENV-76-23277)

(PB80-101520; UCB/EERC-79/18; NSF/RA-790240) Avail: NTIS HC A04/MF A01 CSCL 18E

A plane-strain method for soil structure interaction analysis consisting of the superposition of the free field motions and the interaction motions, in a generalized seismic environment is *presented. The free field is modeled as a horizontally layered* viscoelastic medium and the seismic environment may consist of a combination of S, P and Rayleigh waves. The soil structure *system is modeled with viscoelastic finite elements, transmitting* boundaries viscous boundaries, and a 3 dimensional simulation. Comparative analyses of the same structure are conducted for *an input of R waves and for vertically propagating S and P* waves in a rock site and sand site. GRA

N80-16659# Massachusetts Inst. of Tech., Cambridge. School of Engineering.

BASELINE CORRECTION OF EARTHQUAKE RECORDS IN THE FREQUENCY DOMAIN

E. Kausel and R. Ushijima Jul. 1979 84 p

(Grant NSF ENV-77-18339)

(PB80-102056; MIT-CE-R79-34; NSF/RA-790180) Avail: NTIS HC A05/MF A01 CSCL 08K

Various integration schemes for discrete functions in the frequency domain were examined and procedures to perform a parabolic baseline correction to earthquake records in this domain *were developed. Only for acceleration records having zero mean* value over the interval of definition did the simplest integration scheme analyzed (the pseudo-continuous method) coincide with *the well known integration procedure of dividing the Fourier* Transform of the record by i omega. Records with non-zero mean, on the other hand, required additional terms to achieve *consistency with time domain procedures such as the trapezoidal* rule. The formulae developed were applied to the Golden Gate Earthquake of March 22, 1957, and compared against each other. GRA

N80-16660# National Oceanic and Atmospheric Administration, Boulder, Colo.

THE INTERNAL REFRACTIVE INDEX SPECTRA OF CLOUDS FROM FORWARD SCATTER RADAR OBSERVATIONS

Earl E. Gossard and Richard G. Strauch Jun. 1979 39 p refs
(PB80-107238; NOAA-TR-ERL-WPL-44) Avail: NTIS HC A03/MF A01 CSCL 04A

There are occasions when radar return from a volume of cloud is unexpectedly large if it is presumed to be caused by the classical mechanism of incoherent scatter from individual cloud droplets. Such a mechanism predicts the scattered power to be proportional to the inverse 4th power of the wavelength. The observed weaker wavelength dependence could result from Bragg-coherent scatter from the ensemble of droplets or it could result from an enhancement by the cloud of inhomogeneities in the dielectric constant of the gaseous medium within the cloud. Both mechanisms are discussed and compared with data acquired in a forward scatter mode by the WPL 3 cm radar system. Observed differences between the in-cloud and out-of-cloud refraction index spectra are discussed. GRA

N80-16661# National Oceanic and Atmospheric Administration, Boulder, Colo.

EARTHQUAKE HISTORY OF THE UNITED STATES, 1971 - 1976 SUPPLEMENT

Jerry L. Coffman 1979 49 p refs Sponsored in part by Geological Survey
(PB80-108434; NOAA-EDIS-PUB-41/1; NOAA-79092103) Avail: NTIS HC A03/MF A01 CSCL 08K

Descriptions of earthquakes of Modified Mercelli (MM) intensity five and above (intensity six and above in California) for the years 1971 through 1976 are presented. For each region there is a brief resume of the general seismicity along with data on qualifying earthquakes. The earthquakes are grouped into major and intermediate and minor categories. GRA

N80-16662# Princeton Univ., N. J. Dept. of Civil Engineering.

EARTHQUAKE WAVES IN A RANDOM MEDIUM

L. Chu, A. Askar, and A. S. Cakmak 30 Jun. 1979 47 p refs
(Grant NSF 76-20027)
(PB80-104862; NSF/RA-790127; Rept-79/SM/3) Avail: NTIS HC A03/MF A01 CSCL 08K

Mathematical models are presented for the dynamics of seismic wave propagation through an elastic medium. The energy distribution and energy decay of the waves are examined and a discussion of the relation of the damping coefficient measured in situ and in the laboratory is presented. Sample calculations are presented for single and multilayer systems to obtain response spectra in the laboratory and to Gaussian and actual earthquake input motions. A.W.H.

N80-16663# Geological Survey, Albuquerque, N. Mex. Water Resources Div.

BIBLIOGRAPHY OF GEOLOGY AND HYDROLOGY, EASTERN NEW MEXICO Final Water Resources Investigation

Ann Finley Wright Mar. 1979 175 p
(PB-300832/3; USGS/WRI-79/76; USGS/WRD/WRI-79/060) Avail: NTIS HC A08/MF A01 CSCL 08G

The high plains of the eastern New Mexico region and its natural resources are examined. The bibliography contains 1,900 references concerned with the geology, hydrology, chemistry, and geography of the region. GRA

N80-16664# National Geodetic Survey, Rockville, Md.

DETERMINATION OF ASTRONOMIC POSITIONS FOR CALIFORNIA-NEVADA BOUNDARY MONUMENTS NEAR LAKE TAHOE

James E. Pettey Mar. 1979 22 p refs
(PB-301264/8; NOAA-TM-NOS-NGS-18; NGS-18; NOAA-79090404) Avail: NTIS HC A02/MF A01 CSCL 08G

Astronomic observations at three California-Nevada boundary monuments near Lake Tahoe were conducted. The reported position of the 120th meridian, as given in U.S. Coast and Geodetic Survey Report for 1900 is reported. GRA

N80-16665# Environmental Protection Agency, Washington, D.C. Office of Toxic Substances.

REPORT ON THE PROGRESS OF REGULATIONS TO PROTECT STRATOSPHERIC OZONE Annual Report, 1978 - 1979

Ferial S. Bishop Aug. 1979 57 p refs
(PB-301368/7; EPA-560/12-79-003) Avail: NTIS HC A04/MF A01 CSCL 13B

The progress made in regulating ozone depleting substances is reported. Nonaerosol and miscellaneous chlorofluorocarbons (CFC) uses, including use as refrigerants, foam blowing agents, cleaning agents in the electronic and metal industries, and as solvents are investigated. Regulatory strategies to reduce CFC emissions including: (1) direct regulation, (2) economic incentives and (3) a conservation program are discussed. GRA

N80-16666# National Oceanic and Atmospheric Administration, Boulder, Colo. World Data Center A for Solid Earth Geophysics.

HOMOGENEOUS MAGNITUDE SYSTEM OF THE EURASIAN CONTINENT: P WAVES

Ludmill Christoskov (Bulgarian Acad. Sci.), Nadja V. Kondorskaya (USSR Acad. Sci.), and Jiri Vanek (Czechoslovak Acad. Sci.) Aug. 1979 66 p refs
(PB-301282/0; NOAA-79090403) Avail: NTIS HC A04/MF A01 CSCL 08K

A new procedure for determining the magnitude of an earthquake was developed. This procedure is called the homogeneous magnitude system (HMS). A summary of the steps used to establish an HMS of the Eurasian Continent for P waves is presented. GRA

N80-16667# California Univ., Richmond. Earthquake Engineering Research Center.

ARMA MODELS FOR EARTHQUAKE GROUND MOTIONS

M. K. Chang, J. W. Kwiatkowski, R. F. Nau, R. M. Oliver, and K. S. Pister Jul. 1979 99 p refs
(PB-301166/5; UCB/EERC-79/19) Avail: NTIS HC A05/MF A01 CSCL 08K

An analysis of four major California earthquake records using a class of discrete linear time-domain processes commonly referred to as auto-regressive/moving-average models is presented. Connections, similarities, and differences between traditional continuous models (with parameter estimates based on spectral analyses) and the discrete models with parameters estimated by various maximum likelihood techniques applied to digitized acceleration data in the time domain are discussed. GRA

N80-16668# Washington Univ., Seattle.

PROCEEDINGS OF THE SECOND INTERNATIONAL CONFERENCE ON MICROZONATION FOR SAFER CONSTRUCTION: RESEARCH AND APPLICATION, VOLUME 2

Dec. 1978 515 p refs Conf. held at San Francisco, 26 Nov. - 1 Dec. 1978 Sponsored in part by UNESCO, ASCE, Earthquake Eng. Res. Inst., Seismological Soc. of America, Univ. Council for Earthquake Eng. Res.
(Grant NSF PFR-77-23228)
(PB-301144/2; NSF/RA-780618) Avail: NTIS HC A15/MF A01 CSCL 08K

Seismic investigations of various regions in the world are presented together with earthquake prediction studies. Considerable attention is devoted to such theoretical aspects as peak horizontal and vertical accelerations, the relevancy of one dimensional shear models in predicting surface acceleration, and the theory of connectivity. Studies of shear deformation in sandy soils byacoustic emission response and seismic shear strain induced in soil deposits are reported. Recent earthquake resistant design methods for different types of foundations in Japan are described. GRA

N80-16669# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.

TIME-LAPSE SKY PHOTOGRAPHY USING LOW COST CAMERA SYSTEMS

Gordon Lerfald and Hans Ericson Apr. 1979 17 p ref
(PB-300406/6; NOAA-TR-ERL-WPL-43; NOAA-79080903) Avail: NTIS HC A02/MF A01 CSCL 04A

Time lapse photography systems are described that were developed to provide a record of general sky and atmospheric conditions during field studies of atmospheric parameters. The design emphases were keeping equipment and operation costs

low and operating the systems as automatically as possible. Commercially available components were used where possible. Super-8 movie cameras with electronic shutters were found to be the most satisfactory cameras about which to design the systems. The systems are described in sufficient detail that they can be duplicated. GRA

N80-16076# Joint Publications Research Service, Arlington, Va.
INTERNATIONAL INVESTIGATION OF THE MAGNETOSPHERE
V. V. Migulin and B. I. Silkin *In its* USSR Rept.: Space, No. 1 (JPRS-74805) 20 Dec. 1979 p 3-14 refs Transl. into ENGLISH from Priroda (USSR) no. 6, 1979 p 2-8 (For primary document see N80-16075 07-12)
Avail: NTIS HC A04/MF A01

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N80-16670 Georgia Inst. of Tech., Atlanta.
MONTH AND YEAR AHEAD FORECASTING OF MONTHLY PRECIPITATION FOR THE SOUTHEASTERN UNITED STATES Ph.D. Thesis
William John March 1979 245 p
Avail: Univ. Microfilms Order No. 8002151

Four different statistical techniques were used to develop six models for forecasting monthly precipitation for the southeastern United States. The six models are a Box-Jenkins autoregressive integrated moving-average (ARIMA) model (BJALL), two non-integer harmonic models (NIALL and NIMO), a multiple linear regression model (REGALL) and two models resulting from the combination of forecasts from BJALL and NIALL (COMB2) and from BJALL, NIALL and REGALL (COMBALL). All models were poor predictors of the absolute quantity of precipitation, but they showed some success in forecasting categorical quantity. Overall, REGALL showed better results in forecasting the 1970-1977 years than the other models. Dissert. Abstr.

N80-16671 Colorado State Univ., Fort Collins.
DYNAMICS OF EQUATORIAL MASS-FLOW ADJUSTMENT Ph.D. Thesis
Pedro Leite SilvaDias 1979 217 p
Avail: Univ. Microfilms Order No. 7928547

The problem of the adjustment of the mass and wind fields in a divergent barotropic model was solved on the equatorial beta plane. Contrary to the traditional f plane analysis, the motion does not tend to a perfect geostrophic balance on a short time scale. The beta plane approximation allows for the presence of Rossby waves and since these waves are quasigeostrophic, they may be regarded as the adjusted state. It is also shown that the concept of an adjusted state on the beta plane is dependent on the dispersive properties and energetics of Rossby and gravity waves. Other results are reported. Dissert. Abstr.

N80-16672 Colorado State Univ., Fort Collins.
LINEAR SPECTRAL MODEL OF TROPICAL MESOSCALE SYSTEMS Ph.D. Thesis
Maria Assuncao Faus SilvaDias 1979 232 p
Avail: Univ. Microfilms Order No. 7928546

The sensitivity of mesoscale features with respect to large scale tropical profiles of wind and temperature and to small scale parameterizations was investigated through a linear, spectral, nonhydrostatic model. The cumulus heating parameterization was the so called Wave-CISK parameterization, defined by an idealized moisture budget. It is found that the growth rates of different scales of motion are very sensitive to small scale parameters, such as top of moist layer, mean mixing ratio in moist layer, and level of maximum heating rate. The speed of propagation and the mode of maximum growth rate are not very sensitive to small scale parameterization. Other significant results are reported. Dissert. Abstr.

N80-16673 California Univ., Los Angeles.
NUMERICAL SIMULATION OF THE FORMATION AND DISSIPATION OF STRATUS CLOUD UNDER AN INVERSION Ph.D. Thesis
Fanthune John Moeng 1979 234 p
Avail: Univ. Microfilms Order No. 8001388

Steady-state and transient processes involved in stratus cloud under a sub tropical inversion are examined. A numerical model is developed permiting extensive sensitivity and parameter variation studies. The model includes the following properties: (1) one dimensional, transient; (2) first order closure in turbulent transfer terms; (3) solar radiative transfer; (4) thermal radiation transfer in cloud; (5) soil and sea surface temperature. Field data are simulated by the model and it is determined what input parameterizations (advection and divergence) produce optimal results. Finally, through systematic parameter variation the model shows stratus formation and dissipation to be sensitive to all input parameters within their normal ranges of values. Dissert. Abstr.

N80-16674 Stanford Univ., Calif.
RAPID-SCANNING MEASUREMENTS OF WIND-PRODUCED DOPPLER ON AN ASYMMETRICAL MICROWAVE TRANSHORIZON PROPAGATION PATH Ph.D. Thesis
Ronald Douglas Fleming 1979 131 p
Avail: Univ. Microfilms Order No. 8001917

A rapid data-gathering system is used to remotely probe the wind-field velocity structure in the common volume region of a 164-km transhorizon propagation path. Wind-produced Doppler shifts resulting from average transverse velocities up to about 5 m/s were measured and found consistent both in magnitude and direction with the prevailing winds observed in the lower strata of the common volume region. On numerous occasions Doppler measurement results reflected much higher average velocities (up to 40 m/s) than could be attributed to normal low altitude winds. Time spatial analyses of these anomalous spectra are indicative of aircraft induced atmospheric disturbances. The spectral signatures of these disturbances may provide additional insight into the generation and decay of aircraft trailing vortices. Dissert. Abstr.

N80-16675*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THUNDERSTORM-ENVIRONMENT INTERACTIONS DETERMINED WITH THREE-DIMENSIONAL TRAJECTORIES
Gregory Sims Wilson Washington Jan. 1980 163 p refs (NASA-RP-1054) Avail: NTIS HC A08/MF A01 CSCL 04B

Diagnostically determined three dimensional trajectories were used to reveal some of the scale interaction processes that occur between convective storms and their environment. Data from NASA's fourth Atmospheric Variability Experiment are analyzed. Two intense squall lines and numerous reports of severe weather occurred during the period. Convective storm systems with good temporal and spatial continuity are shown to be related to the development and movement of short wave circulation systems aloft that propagate eastward within a zonal mid tropospheric wind pattern. These short wave systems are found to produce the potential instability and dynamic triggering needed for thunderstorm formation. The environmental flow patterns, relative to convective storm systems, are shown to produce large upward air parcel movements in excess of 50 mb/3h in the immediate vicinity of the storms. The air undergoing strong lifting originates as potentially unstable low level air traveling into the storm environment from southern and southwestern directions. The thermo and hydrodynamical processes that lead to changes in atmospheric structure before, during, and after convective storm formation are described using total time derivatives of pressure or net vertical displacement, potential temperature, and vector wind calculated by following air parcels. R.C.T.

N80-16676*# National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
THE ROLE OF SATELLITE ALTIMETRY IN CLIMATE STUDIES
C. L. Parsons Washington Jan. 1980 32 p refs (NASA-TP-1570) Avail: NTIS HC A03/MF A01 CSCL 04B

The results of three generations of satellite-borne radar

altimetry experiments are summarized. The diverse measurements possible from this instrument are shown to be directly applicable to studies of the importance of the oceans in climate. The radar altimeter has unique value for investigations seeking knowledge of the interconnections between ocean dynamics, heat and momentum transfer across the air-sea interface, sea ice extent, and polar ice sheet thickness. Author

N80-16677# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
A THUNDERSTORM GUST FRONT DETECTION SYSTEM. PART 1: SYSTEM OPERATION AND SIGNIFICANT CASE STUDIES. PART 2: STATISTICAL RESULTS Summary Report, Oct. 1978 - Apr. 1979
A. J. Bedard, Jr., F. H. Merrem, D. Simms, and M. M. Cairns Aug. 1979 146 p refs
(Contract DOT-FA76-WAI-822)
(AD-A075922; FAA-RD-79-55-Pt-2) Avail: NTIS HC A07/MF A01 CSCL 01/5

The data presented demonstrate the importance of stable surface layers in determining how well surface temperature and wind measurements represent flow at higher levels and explain underestimates of system severity. The wind and pressure sensors combine to provide a total system offering good reliability for detection of thunderstorm outflows. An array configuration (composed of wind and pressure jump sensors) are recommended for use in airport warning systems. This configuration extending about 10 km from the airport provides a warning for thunderstorm gust-fronts. The data set offers wide possibilities for further exploitation including case study comparisons with numerical models, case study comparisons with weather radar data, and summaries of shear data and Doppler sounder profiles for use by those computing aircraft response and those designing remote sensing systems. M.M.M.

N80-16678*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
A COMPARISON OF GLAS SAT AND NMC HIGH RESOLUTION NOSAT FORECASTS FROM 19 AND 11 FEBRUARY 1978
Robert Atlas Nov. 1979 19 p refs
(NASA-TM-80591) Avail: NTIS HC A02/MF A01 CSCL 04B

A subjective comparison of the Goddard Laboratory for Atmospheric Sciences (GLAS) and the National Meteorological Center (NMC) high resolution model forecasts is presented. Two cases where NMC's operational model in 1976 had serious difficulties in forecasting for the United States were examined. For each of the cases, the GLAS model forecasts from initial conditions which included satellite sounding data were compared directly to the NMC higher resolution model forecasts, from initial conditions which excluded the satellite data. The comparison showed that the GLAS satellite forecasts significantly improved upon the current NMC operational model's predictions in both cases. R.E.S.

N80-16679# Institut Royal Meteorologique de Belgique, Brussels.
THE WEATHER IN 1978 [LE TEMPS EN 1978]
R. Sneyers 1979 53 p In FRENCH
Avail: NTIS HC A04/MF A01

The general atmospheric situation in Belgium was marked by the predominance of a depression regime from the middle of winter until the middle of summer. This predominance was followed by an anticyclonic regime which lasted until the end of the year. The persistent return of the anticyclonic regime from the middle of summer and the resulting rain deficit, the winter hygrometric deficit, and the mediocre thermal conditions from the middle of summer until the beginning of autumn are considered the most salient facts about Belgian weather in 1978. Variations in wind, air temperature, humidity, and precipitations are discussed for each month. Transl. by A.R.H.

N80-16680# Institut Royal Meteorologique de Belgique, Brussels.
RECENT RAIN MEASUREMENT MAPS OF BELGIUM [LES NOUVELLES CARTES PLUVIOMETRIQUES DE LA BELGIQUE. DE NIEUWE PLUVIOMETRISCHE KAARTEN VAN BELGIE]
G. L. Dupriez and R. Sneyers 1979 20 p In FRENCH and FLEMISH This accession also covers all 1979 issues received to date
Avail: NTIS HC A02/MF A01

Meteorological charts of the normal rainfall in Belgium are presented. The charts are presented for each month of the year and show the average rainfall by altitude. Transl. by A.W.H.

N80-16681# National Oceanographic Data Center, Washington, D. C. Environmental Data and Information Service.
MARINERS WEATHER LOG, VOLUME 23, NUMBER 4,
Elwyn E. Wilson, ed. Jul. 1979 76 p
(PB-300277/1; NOAA-79080201) Avail: NTIS HC A05/MF A01 CSCL 04B

Articles contained in this issue include a report on the tropical storm Agnes and a discussion of ice navigation through the Great Lakes. A review of marine meteorology for the North Atlantic and Pacific Oceans is presented. A.W.H.

N80-16682*# National Aeronautics and Space Administration, Wallops Station, Wallops Island, Va.
RESULTS OF THE AUGUST 1977 SOVIET AND AMERICAN METEROLOGICAL ROCKETSONDE INTERCOMPARISON HELD AT WALLOPS ISLAND, VIRGINIA
Francis J. Schmidlin, Joseph R. Duke, Andre I. Ivanovsky, and Y. M. Chernyshenko Feb. 1980 193 p refs Prepared in cooperation with the Hydrometeorological Service of the USSR
(NASA-RP-1053) Avail: NTIS HC A09/MF A01 CSCL 04B

A coordinated program of rocketsonde investigations along about 60 deg E and 70 deg W between the United States and U.S.S.R. is discussed. The rocketsonde instruments used by the U.S. and U.S.S.R. were compared and the results are presented. The U.S. Super Loki Datasonde and the U.S.S.R. M100B rocketsonde are discussed. Results indicate that the U.S/U.S.S.R. rocketsonde measurement agreement improved since the 1973 intercomparisons. It was learned that the mean of the differences of the temperatures compare to within 6 C at about 60 km and to within 2 C near 50 km. Wind measurements were also found to agree. A.W.H.

N80-16683*# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala. Space Sciences Lab.
AVE-SESAME 1: 25-MB SOUNDING DATA
Myron L. Gerhard (Texas A and M Univ., College Station), Henry E. Fuelberg (St. Louis Univ., Missouri), Steven F. Williams (Texas A and M Univ., College Station), and Robert E. Turner Dec. 1979 365 p
(NASA-TM-78256) Avail: NTIS HC A16/MF A01 CSCL 04B

Seven atmospheric variability experiments (AVE), two atmospheric variability and severe storms experiments (AVSSE), and six atmospheric variability experiment-severe environmental storm and mesoscale experiments (AVE-SESAME) conducted by NASA are discussed. The dates, observation times, and data reports for each of the experiments for which data was processed are listed. The AVE experiments were conducted primarily to study atmospheric variability with emphasis on spatial and temporal in atmospheric structure that can be detected from soundings taken at 3 hr intervals but not seen in soundings taken at 12 hr intervals. The AVSSE experiments were conducted to study atmospheric structure and variability associated with severe storms combining both rawinsonde and aircraft data to provide information on near storm environments. The method of processing is discussed, estimates of the rms errors in the data are presented, an example of contact data is given, and soundings are listed which exhibited abnormal characteristics. A.W.H.

N80-16684# Committee on Commerce, Science, and Transportation (U. S. Senate).
WEATHER MODIFICATION
Washington GPO 1979 231 p refs Hearings on S. 829 and S. 1644 before the Subcomm. on Sci., Technol., and Space of the Comm. on Commerce, Sci., and Transportation, 96th Congr., 1st Sess., 24 and 26 Oct. 1979
(GPO-55-607) Avail: Subcomm. on Commerce, Sci., and Transportation

Testimony was given and arguments were heard to declare a comprehensive and coordinated national weather resources

management policy, to provide for the development of standards and guidelines for weather resources management, and to establish a national program of research and development in the weather resources management field; and to declare a national weather modification policy, to establish a national program of research and development in weather modification, to provide for the promulgation of regulations related to weather modification, and for other purposes. M.M.M.

N80-16685# Naval Weather Service Environmental Detachment, Asheville, N. C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS (SSMO): SELECTED SOUTH PACIFIC ISLAND MARINE AREAS, VOLUME 3. AREA 17, TAHITI ISLAND AND MOOREA ISLAND; AREA 18, TUAMOTU ARCHIPELAGO; AREA 19, PITCAIRN ISLAND; AREA 20, EASTER ISLAND; AREA 21, ISLA SAN AMBROSIO AND ISLA SAN FELIX; AREA 22, ISLAS JUAN FERNANDEZ; AREA 23, NORFOLK ISLAND; AREA 24, CHATHAM ISLAND
Sep. 1979 643 p
(AD-A073874) Avail: NTIS HC A99/MF A01 CSCL 04/2
This report presents marine climatological data for coastal areas 17 - 24 in 21 different tables including weather occurrence, wind direction and speed, cloud amount, ceiling height, visibility, precipitation, dry bulb, relative humidity, air-sea temperature difference, sea height and period, sea surface temperature and sea level pressure. GRA

N80-16686# Naval Weather Service Environmental Detachment, Asheville, N. C.
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS (SSMO): SELECTED SOUTH PACIFIC ISLAND MARINE AREAS, NEW ZEALAND, VOLUME 4. AREA 25, AUCKLAND WEST; AREA 26, AUCKLAND EAST; AREA 27, COOK STRAIT NW; AREA 28, COOK STRAIT; AREA 29, HAWKE BAY; AREA 30, SOUTH ISLAND NW; AREA 31, FOVEAUX STRAIT; AREA 32, CHRISTCHURCH
Sep. 1979 643 p
(AD-A073875) Avail: NTIS HC A99/MF A01 CSCL 04/2
This report presents marine climatological data for specific coastal areas 25 - 32 in 21 different tables including weather occurrence, wind direction and speed, cloud amount, ceiling height, visibility, precipitation, dry bulb, relative humidity, air-sea temperature difference, sea height and period, sea surface temperature and sea level pressure. GRA

N80-16687# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19304DT GSRS, MISSILE NUMBER 1030, ROUND NUMBER V-55, 12 JULY 1979
Jul. 1979 24 p
(DA Proj. 1T6-65702-D-126)
(AD-A074962; ERADCOM/ASL-DR-10444) Avail: NTIS HC A02/MF A01 CSCL 04/2
Meteorological data gathered for the launching of 19304DT GSRS, Missile Number 1030, Round Number V-55, are presented in tabular form. GRA

N80-16688# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19304DT GSRS MISSILE NUMBER 1066, ROUND NUMBER V-56
Jul. 1979 19 p
(DA Proj. 1T6-65702-D-126)
(AD-A074965; ERADCOM/ASL-DR-1045) Avail: NTIS HC A02/MF A01 CSCL 04/2
Meteorological data gathered for the launching of 19304DT GSRS, Missile Number 1066, Round Number V-56, are presented in tabular form. GRA

N80-16689# Army Electronics Research and Development Command, White Sands Missile Range, N. Mex.
THE 19304DT GSRS MISSILE NUMBER 1035, ROUND NUMBER V-57
26 Jul. 1979 21 p
(DA Proj. 1T6-65702-D-126)
(AD-A074980; ERADCOM/ASL-DR-1046) Avail: NTIS HC A02/MF A01 CSCL 04/2
Meteorological data gathered for the launching of 19304DT GSRS, Missile Number 1035, Round Number V-57, are presented in tabular form. GRA

N80-16690# Army Electronics Research and Development Command, White Sands Missile Range, N. Mex. Atmospheric Sciences Lab.
THE 1930 GSRS, MISSILE NUMBERS 1115, 1116, 1117, ROUND NUMBERS V-58, V-59, V-60, 30 JULY 1979 Meteorological Data Report
Jul. 1979 22 p
(DA Proj. 1T6-65702-D-126)
(AD-A074981; ERADCOM/ASL-DR-1047) Avail: NTIS HC A02/MF A01 CSCL 04/2
Meteorological data gathered for the launching of 19304 GSRS, Missile numbers 1115 thru 1117, Round Numbers V-58 through V-60, are presented in tabular form. GRA

N80-16691# Army Electronics Research and Development Command, White Sands Missile Range, N. Mex. Atmospheric Sciences Lab.
THE 19702A GSRS, MISSILE NUMBER 340, ROUND NUMBER B-27, 6 AUGUST 1979 Meteorological Data Report
Aug. 1979 25 p
(DA Proj. 1T6-65702-D-126)
(AD-A074982; ERADCOM/ASL-DR-1048) Avail: NTIS HC A02/MF A01 CSCL 04/2
Meteorological data gathered for the launching of 19702A GSRS, Missile Number 340, Round Number B-27, are presented in tabular form. GRA

N80-16692# Atmospheric Sciences Lab., White Sands Missile Range, N. Mex.
THE 19702A GSRS, MISSILE NUMBER 303, ROUND NUMBER B-28, 6 AUGUST 1979 Meteorological Data Report
Aug. 1979 24 p
(DA Proj. 1T6-65702-D-125)
(AD-A074983; ERADCOM/ASL-DR-1049) Avail: NTIS HC A02/MF A01 CSCL 04/2
Meteorological data gathered for the launching of 19702A GSRS, Missile Number 303, Round Number B-28, are presented in tabular form. GRA

N80-16693# Oak Ridge National Lab., Tenn.
METEOROLOGICAL EFFECTS OF THERMAL ENERGY RELEASES (METER) PROGRAM Annual Progress Report, Oct. 1977 - Sep. 1978
A. A. N. Patrinos, comp. and H. W. Hoffman, comp. Jun. 1979 131 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6867) Avail: NTIS HC A07/MF A01
The meteorological effects of thermal effluents from power plants are discussed. Information from six separate studies on the subject is presented. The studies involved: rainfall measurements; drift from mechanical draft cooling towers; environmental impact of evaporative plumes; temperature measurements of downwind plumes for plants having 3 or 4 mechanical draft cooling towers in flat terrain; the prediction of local effects of cooling ponds; and self precipitation of snow from cooling towers. DOE

N80-16694# California Univ., Livermore. Lawrence Livermore Lab.
PROSPECTS FOR MONTHLY FORECASTS WITH 3-D GLOBAL WEATHER MODELS
W. J. Quirk 21 Jun. 1979 9 p refs Presented at the 4th Conf. on Numerical Weather Prediction, Silver Spring, Md., 29 Oct. - 1 Nov. 1979
(Contract W-7405-eng-48)
(UCRL-82548; CONF-791038-1) Avail: NTIS HC A02/MF A01
The need for improved methods of forecasting climate variations is considered. The stochastic dynamic forecast method is proposed as one way of improving forecast skill. It is shown that model forecasts of space-time averaged quantities have much smaller errors than forecasts of quantities at a particular time

and place. These errors are small enough that use of stochastic techniques can reduce forecast errors still further. DOE

N80-16695# California Univ., Berkeley. Lawrence Berkeley Lab.
SIMPLIFIED PROCEDURE FOR CALCULATING THE EFFECTS OF DAYLIGHT FROM CLEAR SKIES
H. J. Bryan Sep. 1979 33 p refs Presented at the Ann. Illuminating Eng. Soc. Tech. Conf., Atlantic City, N.J., 16-20 Sep. 1979
(Contract W-7405-eng-48)
(LBL-9048; CONF-790916-2; EEB-W-79-08) Avail: NTIS HC A03/MF A01

A simplified procedure for calculating daylight illumination at any point within a room under clear sky conditions is described which is consistent with the CIE recommended daylight factor method. The calculation procedure used here separates the light reaching the point being considered into three components: light directly from the sky and light after reflection from external and internal surfaces. Graphs and tables are developed for these components in order to evolve a calculation procedure which is simple to apply rather than lengthy direct computation from first principles. A validation case study is presented in order to demonstrate the accuracy of the proposed calculation procedure. DOE

N80-16696# North American Weather Consultants, Goleta, Calif.
PROJECT SKYWATER. SKYWATER CONFERENCE 10, JUNE 1978: THE SIERRA COOPERATIVE PILOT PROJECT DESIGN
Dept. of the Interior Jun. 1979 362 p Conf. held at South Lake Tahoe, 22-23 Jun. 1978
(Contract DI-7-07-83-V0008)
(PB-298529/9) Avail: NTIS HC A16/MF A01 CSCL 04B

The proposed design for a winter weather modification project is considered. Task force workshops conducted in three areas: extended areas of effect, tracers, and contamination, and hypotheses are summarized. The environmental impact statement status, environmental monitoring work, and results from preliminary field studies are covered. GRA

N80-16697# Texas A&M Univ., College Station. Dept. of Meteorology.
MESOSCALE CHARACTERISTICS OF THE TEXAS HIPLEX AREA DURING SUMMER 1977 Final Report, Sep. 1977 - Aug. 1979
James R. Scoggins, Gregory S. Wilson, and Steven F. Williams Austin, Tex. Texas Dept. of Water Resources May 1979 453 p refs
(Contract DI-14-06-D-7587)
(PB-298963/0; TDWR/LP-99) Avail: NTIS HC A20/MF A01 CSCL 04B

Mesoscale meteorological data are analyzed and results presented for each day separately. In addition, composite analyses of selected surface variables and atmospheric energetics, mixing ratio, velocity divergence, vertical motion, vertical flux of moisture, moisture divergence, equivalent potential temperature, vorticity, sea level pressure, and pressure change are presented. Charts of analyzed fields determined from data placed on a 15 km grid are compared with radar data coded on a similar grid. Variables considered in the upper air analysis include mass divergence, vertical motion, moisture divergence, and budgets of latent heat energy, kinetic energy, and water vapor. Composite analyses are presented for the surface and upper air variables as a function of convective activity. GRA

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N80-16698 Miami Univ., Fla.
A STEADY THERMOHALINE CONVECTION MODEL (DRIVEN BY TURBULENT BUOYANT PLUMES FROM MULTIPLE ISOLATED SOURCES IN A LARGE NONTURBULENT FINITE REGION, WITH APPLICATIONS TO THE OCEANIC THERMOHALINE CIRCULATION) Ph.D. Thesis
William Horatio Peterson 1979 180 p
Avail: Univ. Microfilms Order No. 8001679

A two dimensional steady convection model driven by an isolated turbulent buoyant plume in a finite region is developed and extended to include multiple plumes. When the plumes are taken to be inclined wall plumes, the added effects of wall drag and slope are investigated and shown not to effect the qualitative behavior of the model. The model developed suggests behavior qualitatively different from that of previous thermohaline circulation models. The two most important results are: (1) that the interior vertical velocity is small in the thermohaline and increases with depth; and (2) the inclusion of multiple deep water sources and the phenomenon of plume termination with the attendant implications of the terminating plume becoming a mid-depth source. Dissert. Abstr.

N80-16699 South Carolina Univ., Columbia.
A SIMULATION MODEL OF ESTUARINE SUBSYSTEM COUPLING AND CARBON EXCHANGE WITH THE SEA Ph.D. Thesis
James Kevin Summers 1979 341 p
Avail: Univ. Microfilms Order No. 8002279

A CSMP-III systems model was constructed describing the interactions of the salt marsh, oyster reef, water column, and subtidal benthos subsystems and their relationship to the environmental forcing functions of insolation, water temperature, tidal remixing, sea level, the areal contribution of each subsystem, and offshore concentrations of particulate organic matter (POM) and dissolved organic matter (DOM). Initial simulations indicate that the model output is stable and reproduces some of the major trends of a salt marsh ecosystem. The results of experimental studies suggest that annual variations in sea level resulting in variable tidal coverage of the salt marsh, offshore concentrations of POM and DOM, and the ratio of the surface areas of the marsh and water column subsystems all play important roles in the control of the exchange processes. In addition, the role of tidal remixing is particularly important in the control of annual DOM exchange between the estuary and the sea. Dissert. Abstr.

N80-16700*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE ENHANCED NODAL EQUILIBRIUM OCEAN TIDE AND POLAR MOTION
Braulio V. Sanchez Nov. 1979 23 p refs Submitted for publication
(NASA-TM-80592) Avail: NTIS HC A02/MF A01 CSCL 08C

The tidal response of the ocean to long period forcing functions was investigated. The results indicate the possibility of excitation of a wobble component with the amplitude and frequency indicated by the data. An enhancement function for the equilibrium tide was postulated in the form of an expansion in zonal harmonics and the coefficients of such an expansion were estimated so as to obtain polar motion components of the required magnitude. R.E.S.

N80-16701# Geological Survey, Woods Hole, Mass. Office of Marine Geology.
SOUTH ATLANTIC OUTER CONTINENTAL SHELF GEOLOGICAL STUDIES, FY 1976 Final Report, 1 Oct. 1976 - 30 Sep. 1977
Aug. 1979 46 p refs
(Contract DI-AA550-MU6-56)
(PB-300822/4; BLM/YM/ES-79/12) Avail: NTIS HC A03/MF A01 CSCL 08G

A geological survey to study to southeastern U.S. Atlantic Continental Margin to assess conditions and hazards that might cause or distribute oil spills or other pollutants, or constrain petroleum exploration or development of the area is discussed. The rate of sediment mobility over the sea bed was measured and the resultant changes in bottom morphology and texture was monitored. The vertical distribution of trace metals in the near surface sediment was determined and the concentration, distribution, and flux of suspended particulate matter in the water column was examined. The results are discussed including the findings on the distribution of reefs and hardgrounds in the Georgia Bight, Vibracore studies of the Georgia Embayment Shelf,

and the Geology of the Florida-Hatteras Slope and Inner Blake Plateau. A map of the South Atlantic Outer Continental Shelf hazards is presented. A.W.H.

N80-16702# Geological Survey, Woods Hole, Mass. Office of Marine Geology.
SOUTH ATLANTIC OUTER CONTINENTAL SHELF GEOLOGICAL STUDIES, FY 1976 Final Report, 1 Oct. 1976 - 30 Sep. 1977
Aug. 1979 574 p
(Contract DI-AA550-MU6-56)
(PB-300820/8; BLM/YM/ES-79/11) Avail: NTIS HC A24/MF A01 CSCL 08G

A geological survey to: (1) measure the rate of sediment mobility over the sea bed and monitor resultant changes in bottom morphology and texture; (2) determine the concentration, distribution, and flux of suspended particulate matter in the water column; (3) determine the vertical distribution of trace metals in the near surface sediment at selected locations; (4) evaluate potential geological hazards to oil and gas development due to surficial and intermediate depth structure and mass sediment transport events; (5) identify and determine significance of outcrop and reef structures; and (6) support the activities of the chemical/biological benchmark contractor by obtaining supportive sediment texture, composition, and physical oceanographic information is discussed. GRA

N80-16703# State Univ. of New York at Stony Brook. Marine Sciences Research Center.
AN ASSESSMENT OF THE EFFECTS OF BATHYMETRIC CHANGES ASSOCIATED WITH SAND AND GRAVEL MINING ON TIDAL CIRCULATION IN THE LOWER BAY OF NEW YORK HARBOR
Kuo-Chuin Wong and R. E. Wilson Jan. 1979 31 p refs
(PB80-106487; SR-18; REF-79-1; NOAA-79091303) Avail: NTIS HC A03/MF A01 CSCL 08C

Tidal circulation patterns and tidal elevations in the lower bay of the New York harbor were numerically simulated for a number of altered bathymetries corresponding to hypothetical mining operations. Results suggest that tidal currents will decelerate over the mined region and accelerate outside of them, and that the tidal stream will be deflected towards the region. It is also clear that the mining near the mouth of the bay could increase tidal range along Staten Island substantially. GRA

N80-16704# Woods Hole Oceanographic Institution, Mass.
ON THE PROPAGATION OF FREE TOPOGRAPHIC ROSSBY WAVES NEAR CONTINENTAL MARGINS Ph.D. Thesis
Hsien Wang Ou Aug. 1979 137 p refs
(Grants NSF OCE-76-01813; NSF OCE-78-19513)
(PB-299949/8; WHOI-79-67) Avail: NTIS HC A07/MF A01 CSCL 08C

An analytical model constructed to study the propagation of free topographic Rossby waves in an infinite wedge filled with a uniformly stratified fluid is presented. The problem is found after some coordinate transformations to be identical to the corresponding surface gravity wave problem in a homogeneous fluid but with the roles of the surface and bottom boundaries interchanged. Analytical solutions are discussed for both progressive and trapped waves and their properties are examined. The model predictions are compared with the data taken from NESS76, a New England shelf/slope experiment. GRA

N80-16705# Woods Hole Oceanographic Institution, Mass.
THE INFLUENCE OF DIFFERENTIAL PRODUCTION AND DISSOLUTION OF THE STABLE ISOTOPE COMPOSITION OF PLANKTONIC FORAMINIFERA Ph.D. Thesis
Jonathan Erez Jun. 1979 149 p refs
(Grant NSF OSD-77-07732)
(PB-299724/5; WHOI-79-54) Avail: NTIS HC A07/MF A01 CSCL 08A

Planktonic foraminifera from plankton tows, sediment traps and sediments from the central North Atlantic were studied. The oxygen and carbon isotope compositions, possibly caused by symbiotic algae that photosynthetically enhance incorporation of metabolic CO2 in the skeleton are discussed. The effect of dissolution on the glacial-interglacial amplitude of the Pleistocene isotopic record in the Atlantic and Pacific Oceans is investigated. GRA

N80-16706# Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, Maine.
COASTAL UPWELLING ECOSYSTEMS ANALYSIS: RESPIRATION AND RESPIRATORY ELECTRON TRANSPORT ACTIVITY IN PLANKTON FROM THE NORTHWEST AFRICAN UPWELLING AREA
T. T. Packard Jan. 1979 79 p refs
(PB-301029/5; NSF/IDOE-79/55; NSF/IDOE/CUEA-TR-47)
Avail: NTIS HC A05/MF A01 CSCL 08C

Microplankton and zooplankton respiration were calculated from ETS activity measurements in the upwelled waters off Cape Blanc, Mauritania. Respiration-photosynthesis ratios were calculated from two different assessments of gross productivity. Correlations support the assumption that phytoplankton metabolism. The role of the zooplankton in the regeneration of ammonium in the euphotic zone was investigated by calculating an ammonium excretion rate from zooplankton respiration and comparing this to phytoplankton NH + 4 uptake rates. The hypothesis that the large difference in productivity between the Peru Current and the N.W. African upwelling systems is explained by the differences in the ratio of the compensation depth to the mixed layer depth was tested. GRA

N80-16707# Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, Maine.
COASTAL UPWELLING ECOSYSTEMS ANALYSIS. NITRATE REDUCTASE ACTIVITY IN THE NORTH WEST AFRICAN UPWELLING AREA
T. T. Packard, V. Jones, and D. Blasco Jan. 1979 104 p refs
(Grants NSF OCE-77-18688; NSF OCE-78-00610; Grant NSF OCE-75-23718)
(PB-301030/3; Contrib-78035; NSF/IDOE-79/56; NSF/IDOE/CUEA/TR-50) Avail: NTIS HC A06/MF A01 CSCL 08C

The transfer rates of nitrogen between trophic levels in a food web are discussed in relation to the dynamics of an upwelling ecosystem. The biochemical and environmental regulatory processes of nitrate reduction in the phytoplankton from the N. W. African upwelling system are examined. The importance of time series stations, drogue stations, and cross shelf profiles is discussed. GRA

N80-16708# Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, Maine.
COASTAL UPWELLING ECOSYSTEMS ANALYSIS. INTERACTIONS OF PRIMARY NUTRIENT AND CARBON UPTAKE IN THE PERU CURRENT: A REVIEW AND SYNTHESIS OF LABORATORY AND FIELD RESULTS
R. C. Dugdale, B. H. Jones, Jr., J. J. MacIsaac, and J. J. Goering Feb. 1979 60 p refs Prepared in cooperation with Alaska Univ., College.
(Grant NSF OCE-77-27006)
(PB-301031/1; NSF/IDOE-79/54; NSF/IDOE/CUEA/TR-51)
Avail: NTIS HC A04/MF A01 CSCL 08C

The elaboration of a model linking nutrient-limited uptake of primary nutrient and photosynthetic processes is presented. The model of nutrient-limited growth described by Dugdale (1977) was expanded to include multiple-nutrient uptake. The resulting model expands the theoretical basis for the planning and interpretation of observations of primary production and nutrient processes in eutrophic regions of the sea such as the Peruvian upwelling system. GRA

N80-16709# National Marine Fisheries Service, Bay Saint Louis, Miss. National Fisheries Engineering Lab.
OBSERVATIONS OF TEMPERATURE, CURRENT, AND WIND VARIATIONS OFF THE CENTRAL EASTERN COAST OF FLORIDA DURING 1970 AND 1971
Thomas D. Leming Aug. 1979 189 p refs
(PB-301280/4; NOAA-TM-NMFS-SEFC-6; NMFS/SEFC-6; NOAA-79083001) Avail: NTIS HC A09/MF A01 CSCL 08C

Results of an approximately monthly series of XBT transects during 1971 near Cape Canaveral revealed a pronounced seasonal difference in thermal structure over the continental shelf. The

coastal waters were strongly vertically in winter. This was interpreted as due to increased strength and onshore movement of the Florida Current during the summer months, which was accompanied by intrusion of cold water along the bottom onto the shelf. Following offshore retreat of the Florida Current, cold water lenses 80 km long, 10 km wide, and 5 m thick remained over the bottom in the mid-shelf zone. GRA

N80-16710# East Carolina Univ., Greenville, N.C. Dept. of Biology.
THE DISTRIBUTION AND SEASONALITY OF THE BENTHIC AQUATIC MACROPHYTES OF THE PAMLICO RIVER ESTUARY, NORTH CAROLINA M.S. Thesis
Steven E. Reed Jan. 1979 67 p refs
(Contract DI-14-31-0001-5033)
(PB-300496/7; W79-09834; OWRT-A-077-NC(11)) Avail: NTIS HC A04/MF A01 CSCL 08A

The distribution and seasonal dynamics of the submersed vascular plants and macroscopic algae of the Pamlico River estuary, North Carolina, were studied. Plants were restricted mainly to the sandy shallow margins in the upper two thirds of the estuary with most of the biomass around 1 m depth. The estuary was divided into oligo-, meso- and polyhaline zones based on a rather unstable salinity gradient. In the oligohaline zone macrophyte communities consisted of Vallisneria americana, Potamogeton perfoliatus, Najas guadalupensis, and the muskgrasses Chara sp. and Nitella sp.; the mesohaline zone included V. americana, P. perfoliatus and Ruppia maritima. Line transects were used to sample biomass and community species composition during the seasonal studies. GRA

N80-16711# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
A NUMERICAL INVESTIGATION OF THE BERING SEA CIRCULATION USING A LINEAR HOMOGENEOUS MODEL
Y. J. Han (Oregon State Univ.) and J. A. Galt Jun. 1979 40 p refs
(PB-299884/7; NOAA-TM-ERL-PMEL-15; NOAA-79080902) Avail: NTIS HC A03/MF A01 CSCL 08C

A linear diagnostic model constructed to simulate the Bering Sea circulation is presented. Monthly mean wind stresses along with lateral water mass exchanges were used as model forcing functions. The numerical solutions obtained for the case of annual mean wind stress are presented. GRA

N80-16712# Woods Hole Oceanographic Institution, Mass.
POLEWARD HEAT FLUX AND CONVERSION OF AVAILABLE POTENTIAL ENERGY IN DRAKE PASSAGE
Harry L. Bryden 1979 24 p refs Repr. from J. Marine Res., v. 37, no. 1 p 1-22
(Grant NSF OCE-77-22887)
(PB-301311/7; WHOI-CONTRIB-4099; NSF/IDOE-79/76) Avail: NTIS HC A02/MF A01 CSCL 08J

Energetic fluctuations that transport heat poleward in the Drake Passage are studied. The rate of conversion is found to be approximately equal to the rate at which wind puts energy into the water column. Comparison is made with the baroclinic instability model which predicts conversion of available potential energy. The vertical phase function proved difficult to observe. The signature of the instability process is that temperature and poleward velocity are nearly in phase. A 90 degree phase difference between poleward and eastward velocity components and a dominance of energy in the counterclockwise half of the rotary spectrum are associated with this signature. GRA

N80-16713# Oregon State Univ., Corvallis. School of Oceanography.
TEMPERATURE SECTIONS ALONG THE C-LINE OVER THE SHELF OF CABO NAZCA, PERU FROM MOORED CURRENT METERS, 18 MARCH-10 MAY 1977 AND CTD OBSERVATIONS, 5 MARCH-15 MAY 1977
K. H. Brink, W. E. Gilbert, and A. Huyer Jan. 1979 67 p refs
(Grants NSF OCE-78-03380; NSF OCE-78-03381)
(PB-301101/2; REF-79-2; NSF/IDOE/CUEA/TR-49; NSF/IDOE-79/58) Avail: NTIS HC A04/MF A01 CSCL 08J

Over the continental shelf at 15 degress off Peru, sigma-t is a well-defined function of temperature and hence temperature alone may be used to monitor the changes in stratification, to test the thermal wind equation, and to monitor the hydrographic response to wind events. Vertical-offshore distributions of temperature over the continental shelf and upper slope along a single line as measured by repeated hydrographic sections and a moored current meter array are presented. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N80-16714* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METHOD AND APPARATUS FOR ELIMINATING LUMINOL INTERFERENCE MATERIAL Patent
Eldon L. Jeffers (Boeing Aerospace Co., Houston, Tex.) and Richard R. Thomas, inventors (to NASA) (Boeing Aerospace Co., Houston, Tex.) Issued 27 Nov. 1979 10 p Filed 9 Feb. 1978 Supersedes N78-18674 (16 - 09, p 1197) Sponsored by NASA
(NASA-Case-MSC-16260-1; US-Patent-4,176,007; US-Patent-Appl-SN-876440; US-Patent-Class-435-34; US-Patent-Class-422-52; US-Patent-Class-23-927) Avail: US Patent and Trademark Office CSCL 06A

A method and apparatus for removing porphyrins from a fluid sample which are unrelated to the number of bacteria present in the sample and prior to combining the sample with luminol reagent to produce a light reaction is disclosed. The method involves a pre-incubation of the sample with a dilute concentration of hydrogen peroxide which inactivates the interfering soluble porphyrins. Further, by delaying taking a light measurement for a predetermined time period after combining the hydrogen peroxide-treated water sample with a luminol reagent, the luminescence produced by the reaction of the luminol reagent with ions present in the solution, being short lived, will have died out so that only porphyrins within the bacteria which have been released by rupturing the cells with the sodium hydroxide in the luminol reagent, will be measured. The measurement thus obtained can then be related to the concentration of live and dead bacteria in the fluid sample.

Official Gazette of the U.S. Patent and Trademark Office

N80-16715* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METHOD FOR SEPARATING BIOLOGICAL CELLS Patent
Donald E. Brooks, inventor (to NASA) (Oregon Univ., Portland) Issued 1 Jan. 1980 5 p Filed 6 Mar. 1979 Supersedes N79-21743 (17 - 12 p 1616) Sponsored by NASA
(NASA-Case-MFS-23883-1; US-Patent-4,181,589; US-Patent-Appl-SN-017888; US-Patent-Class-204-180R; US-Patent-Class-204-299R; US-Patent-Class-424-12) Avail: US Patent and Trademark Office CSCL 06A

A method for separating biological cells by suspending a mixed cell population in a two-phase polymer system is described. The polymer system consists of droplet phases with different surface potentials for which the cell populations exhibit different affinities. The system is subjected to an electrostatic field of sufficient intensity to cause migration of the droplets with an attendant separation of cells.

Official Gazette of the U.S. Patent and Trademark Office

N80-16716 Michigan State Univ., East Lansing.
FACTORS INFLUENCING SPECIFIC GROWTH RATES AND SEASONAL ABUNDANCE OF EUTROPHIC LAKE PHYTOPLANKTON Ph.D. Thesis
Gary Frank Marx 1979 94 p
Avail: Univ. Microfilms Order No. 8001561

The seasonal succession of dominant phytoplankton populations and the daily concentrations of major nutrients in a central Michigan waste treatment basin were monitored over the 1977 growing season in order to study the factors controlling the growth of the various species. Carbon and light attenuation due to large algal standing crops, as well as the availability of dissolved organic substances, seemed to be the major factors controlling annual algal productivity. While a simple, kinetics based model was not be able to accurately predict the weekly specific growth

rates of the various species, predictions of approximate periods of growth were quite accurate, making such a model of considerable value for practical use. Dissert. Abstr.

N80-16717 California Univ., Berkeley.
THEORETICAL STUDIES OF THE LIGHT REACTIONS IN PHOTOSYNTHESIS Ph.D. Thesis
Richard Adam Friesner 1979 193 p
Avail: Univ. Microfilms Order No. 8000347

Using magnetic resonance formalism and theoretical formulations to interpret electron paramagnetic resonance (EPR) spectra the light reactions of photosynthesis were studied. A general method of determining the orientational distribution function of a partially ordered ensemble of paramagnetic systems from its EPR lineshape is presented. A radical pair theory of spin polarization for systems of membrane bound radicals with anisotropic g tensors is developed, and used to explain the orientation dependence of the lineshape of the polarized signal. The electron transport cofactors involved in the photosynthetic light reactions in both green plants and photosynthetic bacteria are identified. Dissert. Abstr.

N80-16718*# National Aeronautics and Space Administration, Washington, D. C.
GLUCOSE METABOLISM IN DIFFERENT REGIONS OF THE RAT BRAIN UNDER HYPOKINETIC STRESS INFLUENCE
K. Konitzer (Acad. of Sci. of the Ger. Democratic Republic) and S. Voigt (Acad. of Sci. of the Ger. Democratic Republic) Jan. 1980 15 p refs Transl. into ENGLISH from Acta Biol. Med. Ger. (East Germany), v. 35, 1976 p 853-866 Transl. by Kanner (Leo) Associates, Redwood City, California
(NASA-TM-75949) Avail: NTIS HC A02/MF A01 CSCL 06C

Glucose metabolism in rats kept under long term hypokinetic stress was studied in 7 brain regions. Determination was made of the regional levels of glucose, lactate, glutamate, glutamine, aspartate, gamma-aminobutyrate and the incorporation of C-14 from plasma glucose into these metabolites, in glycogen and protein. From the content and activity data the regional glucose flux was approximated quantitatively. Under normal conditions the activity gradient cortex and frontal pole cerebellum, thalamus and mesencephalon, hypothalamus and pons and medulla is identical with that of the regional blood supply (measured with I131 serum albumin as the blood marker). Within the first days of immobilization a functional hypoxia occurred in all brain regions and the utilization of cycle amino acids for protein synthesis was strongly diminished. After the first week of stress the capillary volumes of all regions increased, aerobic glucose metabolism was enhanced (factors 1.3 - 2.0) and the incorporation of glucose C-14 via cycle amino acids into protein was considerably potentiated. The metabolic parameters normalized between the 7th and 11th week of stress. Blood supply and metabolic rate increased most in the hypothalamus. R.C.T.

N80-16719*# National Aeronautics and Space Administration, Washington, D. C.
MORPHOLOGICAL AND FUNCTIONAL MANIFESTATIONS OF RAT ADRENAL-CORTEX RESPONSE TO SODIUM BROMIDE ADMINISTRATION UNDER HYPODYNAMIC STRESS
L. T. Kirichek (Kharkov Med. Inst.) and V. I. Zholudeva (Kharkov Med. Inst.) Nov. 1979 12 p refs Transl. into ENGLISH from Farmakol. Toksikol. (USSR), v. 38, no. 6, Nov. - Dec. 1975 p 703-706 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-7593) Avail: NTIS HC A02/MF A01 CSCL 05C

Functional and morphological manifestations of adrenal cortex response to hypodynamia (2-hr immobilization on an operating table) under the influence of bromine preparations were studied. The sodium bromide was administered intraperitoneally in 100, 250, and 500 mg/kg doses once and repeatedly during ten days. The adrenal gland was evaluated functionally by ascorbic acid and cholesterol content and morphologically by coloring it with hematoxylin-eosin and Sudans for lipid revealing at freezing. Results are displayed in two tables and microphotographs. They are summarized as follows: the bromine weakens the functional state of the adrenal cortex in intact rats, causing changes similar to those under stress. During immobilization combined with preliminary bromine administration, a less pronounced stress reaction is noticeable. R.C.T.

N80-16720*# National Aeronautics and Space Administration, Washington, D. C.
CATECHOLAMINES AND MYOCARDIAL CONTRACTILE FUNCTION DURING HYPODYNAMIA AND WITH AN ALTERED THYROID HORMONE BALANCE
G. M. Pruss, V. I. Kuznetsov, and A. A. Zhilinskaya Jan. 1980 17 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biolhk. (USSR), no. 2, 1975, p 187-195 Original language document previously announced as A75-32600 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Vitebsk State Medical Inst. (USSR)
(Contract NASw-3199)
(NASA-TM-76000) Avail: NTIS HC A02/MF A01 CSCL 06C

The dynamics of catecholamine content and myocardial contractile function during hypodynamia were studied in 109 white rats whose motor activity was severely restricted for up to 30 days. During the first five days myocardial catecholamine content, contractile function, and physical load tolerance decreased. Small doses of thyroidin counteracted this tendency. After 15 days, noradrenalin content and other indices approached normal levels and, after 30 days, were the same as control levels, although cardiac functional reserve was decreased. Thyroidin administration after 15 days had no noticeable effect. A detailed table shows changes in 17 indices of myocardial contractile function during hypodynamia. K.L.

N80-16721# Louisiana State Univ. and A&M Coll., Baton Rouge. Dept. of Chemistry.
PHYSIO-CHEMICAL INVESTIGATION OF SOME AREAS OF FUNDAMENTAL SIGNIFICANCE TO BIOPHYSICS Annual Report, 1978 - 1979
S. P. McGlynn 7 Aug. 1979 151 p refs
(Contract EY-76-S-05-3018)
(ORO-3018-T1) Avail: NTIS HC A08/MF A01

Biographic titles and descriptions of graduate and postgraduate research efforts for the period 1978-1979 are presented. Work in progress includes analyzing the lowest-energy Rydberg transitions of the alkyl halides; decomposition of a spectroscopic signal S into a system of bands; luminescence of aqueous systems; a study of the effects of small molecules on hydrogen bonding via glass transitions in ethanol; Rydberg/intravalence mixing in the S2 state of azulene; ultraviolet photoelectron spectroscopy of carbonyls; and multi-photon processes. R.E.S.

N80-16722# Rochester Univ., N. Y. Dept. of Radiation Biology and Biophysics.
INFLUENCE OF X IRRADIATION AND DIET ON PITUITARY/THYROID FUNCTION IN THE RAT M.S. Thesis
I. G. Qassar 1979 59 p refs
(Contract EY-76-C-02-3490)
(UR-3490-1674) Avail: NTIS HC A04/MF A01

Rats were maintained on low iodine diet or treated with T sub 4. A significant increase in thyroid weight was observed in rats on low iodine diet whereas among rats on normal diet with thyroxine injections, the thyroid was lower in weight than thyroids of control animals. Pituitary weight increased significantly in rats on low iodine diet or T sub 4 treatment. Where PTU was administered to rats pretreated with either normal diet, normal diet plus T sub 4, or maintained on low iodine diet and then exposed to radiation (100 to 400R) to the neck, it was not possible to distinguish the effect of such local radiation on body growth. Contrary to low iodine treatment, administration of PTU did not result in any increase in pituitary weight in rats maintained on normal diet prior to radiation or in rats maintained on low iodine diet prior to radiation. There was, however, a significant increase in pituitary weight in rats injected with thyroxine prior to radiation (250R or 400R). DOE

N80-16723# Iowa Univ., Iowa City.
ANAEROBIC BIOLOGICAL TREATMENT OF LIQUID WASTES FROM PYROLYSIS PROCESSES Progress Report, 1 Apr. 1977 - 31 Mar. 1979
R. R. Dague 15 May 1979 61 p

(Contract EC-77-S-02-4455)
(COO-4455-2) Avail: NTIS HC A04/MF A01

Experimental work has shown that gas scrubber wastes from the pyrolysis process are high in organics that are toxic to anaerobic biological treatment systems. Carbon was evaluated as a method of pretreatment, co-treatment, or separate treatment for application to the pyrolysis wastes. Experiments with carbon adsorption indicates that wastes can be adsorbed to a high degree. Isotherms indicate an adsorptive capacity of between 0.60 and 0.86 grams of COD per gram of carbon. Suspended growth systems are also discussed. DOE

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N80-16724* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES SUPPLEMENT 201
Jan. 1980 65 p
(NASA-SP-7011(201)) Avail: NTIS HC E03 CSCL 06E

This bibliography lists 191 reports, articles, and other documents introduced into the NASA scientific and technical information system in December 1979. Author

N80-16725* National Aeronautics and Space Administration. Pasadena Office, Calif.
APPARATUS FOR ENDOSCOPIC EXAMINATION Patent
Robert E. Frazer, inventor (to NASA) Issued 4 Dec. 1979 10 p Filed 17 Jun. 1977 Supersedes N79-19678 (17 - 10, p 1328)
(NASA-Case-NPO-14092-1; US-Patent-4,176,662; US-Patent-Appl-SN-807597; US-Patent-Class-128-6; US-Patent-Class-128-348; US-Patent-Class-128-DIG9; US-Patent-Class-138-33; US-Patent-Class-138-103; US-Patent-Class-138-133; US-Patent-Class-219-201; US-Patent-Class-219-522) Avail: US Patent and Trademark Office CSCL 06B

An endoscope is having a propulsion mechanism and at least one transmitter at the distal end transmitting bursts of energy waves (radio frequency or ultrasonic) for tracking the position of the distal end through the use of two or more transducers on the anterior or lateral surfaces of a patient is described. The propulsion mechanism which consists of two radially expandable bladders separated by an axially expandable bellows with only the forward bladder attached to the distal end is discussed. Alternate mechanisms are reported. A sheath on the endoscope which includes material having a sharp melting point slightly above body temperature so that the sheath is made flexible at selected sections by applying current to separate heating wires in the sections of the sheath is described.
Official Gazette of the U.S. Patent and Trademark Office

N80-16726*# National Aeronautics and Space Administration, Washington, D. C.
EFFECT OF GRAVITATION STRESS AND HYPOKINESIA ON BLOOD VESSELS OF THE TESTICLE
E. F. Palazhchenko (I. P. Pavlov First Leningrad Med. Inst.) Nov. 1979 14 p refs Transl. into ENGLISH from Arkh. Anat. Gistol. Embriol. (USSR), v. 64, no. 5, 1973 p 57-63 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75942) Avail: NTIS HC A02/MF A01 CSCL 06S

Rabbits were exposed to single maximum endurable stresses of cranio-caudal direction, hypokinesia for periods of one to eight weeks, and hypokinesia followed by gravitation stresses. The stresses caused dilatation of vessels, greater sinuosity, and occasional ruptures of the walls and extravasation. The greater part of the capillaries were dilated; the greatest part constricted. In hypokinesia there was an increasing atrophy of the testes. Significant results are reported. R.C.T.

N80-16727*# National Aeronautics and Space Administration, Washington, D. C.
THE SIGNIFICANCE OF ACTH FOR THE PROCESS OF FORMATION OF COMPLEX HEPARIN COMPOUNDS IN THE BLOOD DURING IMMOBILIZATION STRESS
B. A. Kudryashov (Moscow State Univ.), F. B. Shapiro (Moscow State Univ.), F. B. Lomovskaya (Moscow State Univ.), and L. A. Lyapina (Moscow State Univ.) Nov. 1979 14 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (USSR), v. 61, no. 2, 1975 p 244-250 Original language document was announced as A75-31019 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75946) Avail: NTIS HC A02/MF A01 CSCL 06S

Adrenocorticotropin (ACTH) was administered to rats at different times following adrenalectomy. Adrenocorticotropin caused a significant increase in the formation of heparin complexes even in the absence of stress factor. When ACTH secretion is blocked, immobilization stress is not accompanied by an increase in the process of complex formation. The effect of ACTH on the formation of heparin complexes was mediated through its stimulation of the adrenal cortex. R.C.T.

N80-16728*# National Aeronautics and Space Administration, Washington, D. C.
EFFECTS OF INGESTION OF COLD AND HOT WATER ON THE COURSE OF THERMAL CHANGES IN THE STOMACH AND INTESTINE
Ye. L. Batinkov Sep. 1979 12 p refs Transl. into ENGLISH from Fiziol. Zh. SSSR (USSR), v. 27, no. 1, 1939 p 108-114 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. Prep. by First Med. Clinic, Crimean Med. Inst. Imenistalin (USSR)
(NASw-3199)
(NASA-TM-75515) Avail: NTIS HC A02/MF A01 CSCL 06P

With the use of a thermocouple and mirror galvanometer, calibrated before the experiment and after each test, it was found that the normal temperature in the esophagus is 0.1-0.4 C higher than in the oral cavity, the temperature in the duodenum is somewhat less than in the stomach, but higher with cholecystitis, duodenitis or gastritis, the temperature in the normal stomach equals or is somewhat higher than in the esophagus, and that the temperature of distended stomachs frequently is lower than in the esophagus. It was found that hot water is retained in the stomach longer than cold water, and that both hot and cold water are allowed to pass into the duodenum when the water temperature becomes approximately equal to that of the surrounding organs. Author

N80-16729*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Mathematics and Statistics.
EMPIRICAL BAYES ESTIMATION OF CRITICAL DOSAGES HAVING SMALLEST PREDICTIVE RISK
Ora Bialik and S. Zacks 15 Aug. 1979 20 p refs Prepared in cooperation with Pennsylvania Univ.
(Contract N00014-75-C-0529; NR Proj. 042-276)
(AD-A074376; TR-38) Avail: NTIS HC A02/MF A01 CSCL 12/1

An empirical Bayes procedure is developed for the estimation of critical dosages in the linear regression case. The empirical Bayes procedure provides consistant estimators of the prior parameters when a large number of independent repetitions of the experiment is available. The methodology is developed to analyze a large set of photodynamic bioassays, for the determination of critical air concentrations of benzo-soluble organic extracts. R.E.S.

N80-16730*# IIT Research Inst., Chicago, Ill.
BIOLOGICAL EFFECTS OF HIGH-VOLTAGE ELECTRIC FIELDS. VOLUME 1: AN UPDATE Final Report
Jul. 1979 224 p refs
(EPRI Proj. 857-1)
(EPRI-EA-1123) Avail: NTIS HC A10/MF A01

Literature which has become available since mid-1974 on the subject of biological effects of power frequency electric fields was reviewed. Some 2000 new entries of both publications and research programs in progress were identified through a computer-aided literature search. Approximately 50 of these

entries are discussed. The general findings of this update confirm the conclusion that it is highly improbable that electric fields from transmission lines have any significant biological effects on healthy individuals who encounter such fields in a normal way under ordinary conditions. However, further research is still needed in order to understand the nature and extent of any effects that could be harmful. DOE

N80-16731# Sinai Hospital, Detroit, Mich.
DEVELOPMENT OF PERCUTANEOUS ENERGY TRANSMISSION SYSTEMS Annual Report, 15 Aug. 1978 - 14 Aug. 1979
A. Kantrowitz, P. S. Freed, A. A. Ciarkowski, F. L. Vaughan (Michigan Univ.), J. I. VeShancey (Michigan Univ.), R. Gray (Michigan Univ.), R. Brabec (Michigan Univ.), and I. Bernstein (Michigan Univ.) 16 Apr. 1979 70 p refs Sponsored in part by National Heart and Lung Inst., Bethesda
(Contract N01-HV-8-2921)
(PB-299739/3; NIH-N01-HV-8-2921-1) Avail: NTIS HC A04/MF A01 CSCL 06B

The initial development of a percutaneous access device is presented. Selected materials were tested for their ability to support cell growth and nutrients were examined for optimizing cell growth and collagen production. To protect the tissue-implant seal from mechanical stresses, alternative surgical techniques were employed to implant a subcutaneous flange. After implanting a flange in a Yucatan miniature pig, forces were applied to the tissue-implant composite. Strain data indicate (1) good fibrotic bonding occurs between the tissue and the implant, and (2) stabilization of the flange with respect to the adjacent dermis. GRA

N80-16732# Saint Elizabeth's Hospital, Brighton, Mass.
DEVELOPMENT OF PERCUTANEOUS ENERGY TRANSMISSION Annual Progress Report, Aug. 1978 - Mar. 1979
Benedict D. T. Daly, Michael Szycher, Michael Worthington, Fred W. Quimby, and Roger G. Warren Apr. 1979 195 p refs
(Contract N01-HV-8-2919)
(PB-300518/8; NIH-N01-HV-8-2919-1) Avail: NTIS HC A09/MF A01 CSCL 06B

A composite percutaneous energy transmission system designed to transmit energy to intracorporeal blood pumps were developed. The system contains five basic components. A carbon coated titanium flange at the level of the skin to provide a non-reactive surface to promote superficial sinus development. Below this level is a porous polytetrafluoroethylene (PTFE) surface bonded to a polyurethane tube. This PTFE extends onto a radially rigid, vertically flexible polyurethane skirt. Below the skirt is a polyurethane tube with a preformed bend. The remainder of the skirt and tube are coated with Dacron fibrils. The PTFE is designed to promote collagen ingrowth to inhibit epithelial downgrowth. The Dacron velour promotes bonding in deeper tissues. GRA

N80-16733# Joint Center for Graduate Study, Richland, Wash.
IMPLANTED ENERGY CONVERSION SYSTEM Annual Report, 1 May 1978 - 1 Mar. 1979
R. P. Johnson, A. Bennett, S. G. Emigh, D. H. Gray, J. R. Noble et al Aug. 1979 491 p refs
(Contract N01-HV-4-2901)
(PBB0-101116; JCGS-7908/217; NIH-N01-HV-4-2901-6) Avail: NTIS HC A21/MF A01 CSCL 06L

The JCGS thermal energy converter program objective is to develop clinically useful permanently implantable Stirling/hydraulic power sources to operate heart-assist or full-heart replacement blood pumps. The energy source is heat from an electric heater or from a radioisotope which could provide complete system implantability. Development has progressed through seven system configurations. Stirling Engine 5 has accumulated 6.3 years of operating time and has demonstrated 4.1 years of maintenance-free operation before failure. The short-stroke pump actuator/controller on accelerated life test has demonstrated 6.6 equivalent years of maintenance-free life without failure and accumulated a total of 16.5 equivalent years of operation. System 5 in-vivo test demonstrated circulation of all systemic blood flow throughout 175-hour test. System 6 complete power source demonstrated 15.5 percent efficiency, 1.2 liter volume, and 2.4 kg weight. System 7 engine module has demonstrated 20.1 percent efficiency with 0.2 liter volume and 0.7 kg weight. GRA

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N80-16734# Federal Aviation Administration, Atlantic City, N.J. National Aviation Facilities Experimental Center.
MODELING PILOT RESPONSE DELAYS TO BEACON COLLISION AVOIDANCE SYSTEM COMMANDS Final Report, Jul. - Sep. 1977
B. Billmann, T. Morgan, and J. Windle Oct. 1979 34 p refs
(FAA Proj. 052-241-310)
(AD-A075946; FAA-RD-79-74; FAA-NA-79-19) Avail: NTIS HC A03/MF A01 CSCL 05/10

Pilot response delays to collision avoidance commands displayed in the cockpit of a General Aviation Trainer simulator were analyzed. For fixed geometries, velocities, and aircraft response rates, the separation at the point of closest approach between aircraft responsing to collision avoidance system (CAS) commands, is inversely related to the length of pilot delay in responding to the CAS command. The Gamma distribution was the best distribution for approximating the empirical data in terms of minimum error mean square, lack of bias, and uniformity of fit. K.L.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N80-16735 Texas Univ., Galveston.
***A STUDY OF OCCUPATIONAL HEAT STRESS BY ANALYSIS OF ENVIRONMENTAL AND HUMAN FACTORS* Ph.D. Thesis**
David Jefferson Calley 1979 289 p
Avail: Univ. Microfilms Order No. 7927487

The environmental and physiological aspects related to workmen in a hot production process in the warm and humid Gulf Coast region of the United States are described. Heat stress and strain was investigated in terms of three heat stress indices, the heat stress index, the wet bulb globe temperature, and the wet globe temperature. Correlation coefficients between these indices are discussed. In addition, medical data and clinical chemistry of blood and urine among workmen with heat illness was investigated. Recommendations were made for prevention of heat illness and for the use of heat stress indices. Precautions were stated related to the work-rest ratios and the estimation and measurement of metabolism and allowable exposure times.
Dissert. Abstr.

N80-16736 Ohio State Univ., Columbus.
***PLANAR BIPED DYNAMICS AND CONTROL* Ph.D. Thesis**
Andrew Zbigniew Ceranowicz 1979 196 p
Avail: Univ. Microfilms Order No. 8001704

Linear feedback was used to control the motion of a mathematical biped model composed of five rigid links connected by ideal torque actuators at pin joints and constrained to move only in the sagittal plane. The equations of motion for the biped model and support equations, which describe the contact between the supporting surface and the feet of the biped, are presented. These equations can be solved simultaneously for the biped's accelerations and ground reaction forces once the dynamic state and control torques are known. For point feet and a hard flat horizontal support surface, there are nine possible sets of support equations, i.e., support phases. Finding the correct support phase for any control torques and dynamic state is discussed. These ideas were implemented in the simulation of walking which required the transition between three support phases.
Dissert. Abstr.

N80-16737*# Ohio State Univ., Columbus. Human Performance Center and Aviation Psychology Lab.

MULTI-MODAL INFORMATION PROCESSING FOR VISUAL WORKLOAD RELIEF
Michael W. Burke, Richard D. Gilson, and Richard J. Jagacinski 1980 28 p refs
(Grant NsG-2179)
(NASA-CR-162720) Avail: NTIS HC A03/MF A01 CSCL 05H

The simultaneous performance of two single-dimensional compensatory tracking tasks, one with the left hand and one with the right hand, is discussed. The tracking performed with the left hand was considered the primary task and was performed with a visual display or a quickened kinesthetic-tactual (KT) display. The right-handed tracking was considered the secondary task and was carried out only with a visual display. Although the two primary task displays had afforded equivalent performance in a critical tracking task performed alone, in the dual-task situation the quickened KT primary display resulted in superior secondary visual task performance. Comparisons of various combinations of primary and secondary visual displays in integrated or separated formats indicate that the superiority of the quickened KT display is not simply due to the elimination of visual scanning. Additional testing indicated that quickening per se also is not the immediate cause of the observed KT superiority. R.E.S.

N80-16738*# General Technical Services, Inc., Upper Darby, Pa.
THERMODYNAMIC CONSIDERATIONS IN THE SUPPORT OF LIFE FOR LONG SPACE VOYAGES Final Report
A. S. Iberall and S. Z. Cardon Nov. 1979 89 p refs
(Contract NASw-3240)
(NASA-CR-162755) Avail: NTIS HC A05/MF A01 CSCL 06K

The essential requirements for the maintenance of life, particularly human life, on isolated space missions of long duration were investigated through the study of extended irreversible thermodynamics. The characterization of a four trophic level system was developed. Questions of stability are discussed. R.E.S.

N80-16739*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala. Structures and Propulsion Lab.
PROSTHETIC DEVICE FOR CORRECTION OF URINARY INCONTINENCE
Ray Helms Dec. 1979 22 p refs
(NASA-TM-78255) Avail: NTIS HC A02/MF A01 CSCL 06B

The development and current status of a prosthetic device for the correction of urinary incontinence is presented.

N80-16740# Monsanto Research Corp., Dayton, Ohio.
PHYSICAL TESTING OF POLYMERS FOR USE IN CIRCULATORY ASSIST DEVICES Annual Report, 1 Jun. 1978 - 31 May 1979
Carl R. McMillin, David L. Sheppard, and Thomas A. Orofino Jul. 1979 48 p refs
(Contract NO1-HV-7-2918)
(PB80-101546; MRC-DA-892; AR-1) Avail: NTIS HC A03/MF A01 CSCL 06L

Fatigue life comparisons of candidate elastomers for use in the artificial heart were made under various conditions. These include: (1) cyclical, progressively increasing, uniaxial strain in air, saline, and in-vitro blood media; (2) progressive uniaxial strain in the same media, with prior cut-growth initiation of samples; and (3) cyclical, biaxial strain in an air environment, accelerated by introduction of various stress concentrators in the samples. Materials evaluated were NBS butyl rubber, Upjohn Pellethane, Goodyear Hexsyn, and Thoratec Biomer. The order of ranking of fatigue lifetime was not the same for the tests cited, and the mode of failure differed for filled (butyl rubber, Hexsyn) and unfilled elastomers. GRA

N80-16741# Bureau of Radiological Health, Rockville, Md. Div. of Electronic Products.
EVALUATION OF COMMERCIALLY AVAILABLE LASER PROTECTIVE EYEWEAR Final Report
Kenneth R. Envall and Ross Murray, Jr. (Laser Effects Branch, USAF School of Aerospace Medicine) May 1979 102 p refs
Prepared in cooperation with USAF School of Aerospace Medicine, Brooks AFB, Tex.
(PB80-103039; DHEW/PUB/FDA-79/8086; FDA/BRH-79/110) Avail: NTIS HC A06/MF A01 CSCL 06Q

Forty commercially available laser protective eyewear materials and ten representative frames were evaluated under non-stress and stress conditions. Parameters such as optical density, spectral transmission, luminous transmittance, refractive and prismatic effects haze, and impact resistance were determined and, where possible, compared to recommended criteria for occupational eye and face protection. In addition, all materials were subjected to shelf-life, environmental, and laser-induced damage tests to determine damage limits and characteristics. GRA

N80-16216*# National Inst. for Occupational Safety and Health, Cincinnati, Ohio.
WHOLE-BODY VIBRATION OF HEAVY EQUIPMENT OPERATORS
D. E. Wasserman, W. C. Asburry, and T. E. Doyle *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 47-68 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 05H

N80-16217*# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.
RESEARCH RELATED TO THE EXPANSION AND IMPROVEMENT OF HUMAN VIBRATION EXPOSURE CRITERIA
Richard W. Shoenberger *In* Shock and Vibration Inform. Center The Shock and Vibration Bull., Pt. 2 Sep. 1979 p 69-79 refs (For primary document see N80-16211 07-31)
Avail: NTIS HC A10/MF A01 CSCL 05H

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see 33 Electronics and Electrical Engineering.

N80-16742*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INFORM: AN INTERACTIVE DATA COLLECTION AND DISPLAY PROGRAM WITH DEBUGGING CAPABILITY
David S. Cwynar Jan. 1980 169 p refs
(NASA-TP-1424; E-9810) Avail: NTIS HC A08/MF A01 CSCL 09B

A computer program was developed to aid ASSEMBLY language programmers of mini and micro computers in solving the man machine communications problems that exist when scaled integers are involved. In addition to producing displays of

quasi-steady state values. INFORM provides an interactive mode for debugging programs, making program patches, and modifying the displays. Auxiliary routines SAMPLE and DATAO add dynamic data acquisition and high speed dynamic display capability to the program. Programming information and flow charts to aid in implementing INFORM on various machines together with descriptions of all supportive software are provided. Program modifications to satisfy the individual user's needs are considered. R.C.T.

N80-16743*# National Aeronautics and Space Administration, Washington, D. C.
LINKING OF THE MINI-COMPUTER ELECTRONIK-100I AND NR-9821A
B. V. Zubkov (Acad. of Sci., Moscow) and V. N. Khromov (Acad. of Sci., Moscow) Nov. 1979 35 p refs Transl. into ENGLISH of "Soprazheniye Mini-EVM Electronika 100I i NR-9821A", Rept. Pr-312 Acad. of Sci. (USSR), Inst. of Space Res., Moscow, 1976 p 1-33 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-75670; Pr-312) Avail: NTIS HC A03/MF A01 CSCL 09B

The means of transmitting digital information from the computer E-100I to the desk top calculator NR-9821A with the help of an intermediate carrier of information (perforated tape) is described. The means of removal of information from the computer E-100I in a form which is understandable for the NR-9821A are given. Instructions for the use and programming of the transcription of information onto magnetic tape from the perforated tape and from the keyboard of the calculator are included. R.C.T.

N80-16744# Air Force Systems Command, Brooks AFB, Tex.
WIZARD: A STRING-ORIENTED MICROPROCESSOR OPERATING SYSTEM Final Report, Oct. 1976 - Sep. 1978
Shelburne D. Wilson, M. Edward Womble, and Michael L. Tworek Aug. 1979 15 p refs
(AD-A074704; SAM-TR-79-14) Avail: NTIS HC A02/MF A01 CSCL 09/2

A string-oriented operating system for Intel-8080-based microcomputers is described. The system consists of a hierarchy of virtual machines. The lowest level virtual machines extend the instruction set of the 8080 to include additional 16-bit arithmetic and logical instructions, new data types, and operators. The data types include strings and string operators derived from the SNOBOL programming language. A table data type is constructed from strings, and table-manipulation operators are provided. A bit-map data type and associated operators are also included. An Input/Output Control System (IOCS) support device-independent IO to multiple devices and diskette files. File name aliases permit many logical IO streams to be dynamically mapped onto a restricted set of physical IO units. Pseudo device handlers expand the capabilities of IO devices and are transparent to application programs. Distributed command decoders interpret IO command strings. Once communication is established with a logical device, a low-overhead IO Vector mechanism may be used for further access. A keyboard monitor provides interactive debugging facilities to application programmers. System resource allocation is implementation dependent and is not embedded in the system nucleus. Multiple implementations over a range of system sizes have demonstrated the utility and adaptability of WIZARD. GRA

N80-16745# School of Aerospace Medicine, Brooks AFB, Tex.
WIZARD PROGRAMMER MANUAL Final Report, Oct. 1976 - Sep. 1978
Shelburne D. Wilson and M. Edward Womble Sep. 1979 41 p
(AF Proj. 7755)
(AD-A074528; SAM-TR-79-15) Avail: NTIS HC A03/MF A01 CSCL 09/2

A string-oriented operating system for the Intel 8080 is described. The system consists of a hierarchy of virtual machines. The lowest virtual machines extend the instruction set of the 8080 to include additional 16-bit arithmetic and logical instructions, new data types, and operators. The data types include strings and string operators derived from the SNOBOL programming language. A table data type is constructed from strings, and table-manipulation operators are provided. A bit-map data type and associated operators are also included. An Input/Output Control System (IOCS) supports device-independent IO to multiple devices and diskette files. File-name aliases permit many logical IO streams to be dynamically mapped onto a restricted set of physical IO units. Pseudo device handlers expand the capabilities of IO devices and are transparent to application programs. Distributed command decoders interpret IO command strings. Once communication is established with a logical device, a low-overhead IO Vector mechanism may be used for further access. A keyboard monitor provides interactive debugging facilities to application programmers. System resource allocation is implementation dependent and is not embedded in the system nucleus. Multiple implementations over a range of system sizes have demonstrated the utility and adaptability of WIZARD. GRA

N80-16746# California Univ., Davis. Dept. of Computing Science.
PERFORMANCE PREDICTION OF COMPUTER ARCHITECTURES OPERATING ON LINEAR MATHEMATICAL MODELS Ph.D. Thesis
L. A. Cox, Jr. 28 Sep. 1978 218 p refs
(Contract W-7405-eng-48)
(UCRL-52582) Avail: NTIS HC A10/MF A01

A limited theory of concurrent computations is developed for concurrent systems based on a requestor/server concept. By use of the Petri-Net concurrent control system model, it is shown that this theory is easily implemented and is capable of predicting the performance of scientific programs running on complex concurrent computer systems. The performance of this type of model is discussed in the light of the requirements for a computer architectural design tool. A number of examples are given to demonstrate the inherent correctness or accuracy. A large-scale computer system design example is presented where this model is used to predict performance. The questions of ease of use, efficiency, and accuracy are discussed, and the problems in the use of this type of approach for predicting performance of software-hardware ensembles are examined. DOE

N80-16747# General Services Administration, Washington, D.C.
INTERNATIONAL BUSINESS MACHINES CORPORATION SYSTEM 34
31 Aug. 1979 56 p
(PB-299650/2; CCVS74-VSR440) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the IBM System 34 COBOL Compiler Release 4 (SS2 Release 4) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated at the Low Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed. GRA

N80-16748# General Services Administration, Washington, D.C.
DATAPOINT 6600 COBOL 2.3
30 Aug. 1979 42 p
(PB-299651/0; CCVS74-VSR445) Avail: NTIS HC A03/MF A01 CSCL 09B

The results obtained from the validation of the subject compiler against the 1974 COBOL Standard are summarized. All categories of discrepancies are listed by level/module within X3.23-1974 and related to each of the Federal levels of the language. A detailed listing of discrepancies is presented together with the tests which were failed. GRA

N80-16749# General Services Administration, Crystal City, Va.
HONEYWELL INFORMATION SYSTEMS COBOLA 0100
31 Aug. 1979 62 p
(PB-299652/8; CCVS74-VSR450) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Honeywell

Level 6 COBOL Computer Version 03/08 (GCOS Version 0400 & 0600) provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated at the Low Intermediate level of FIPS PUB 21-1. The VSR is made up of several sections showing the discrepancies found. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating categories of discrepancies to each of the Federal levels of the language; and a detailed listing of discrepancies together with the tests which were failed. GRA

N80-16750# General Services Administration, Washington, D.C. Automated Data and Telecommunications Service.
DIGITAL EQUIPMENT CORPORATION, PDP 11/70, PDP 11 COBOL, VERSION 4.0
31 Aug. 1979 54 p
(PB-299653/6; CCVS74-VSR425) Avail: NTIS HC A04/MF A01 CSCL 09B

The results obtained from the validation of the subject compiler against the 1974 COBOL Standard are summarized. The compiler was validated at the low intermediate level of FIPS PUB 21-1. An overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974 along with a section relating the categories of discrepancies to each of the Federal levels of the language, and a detailed listing of discrepancies together with the tests which were failed. GRA

N80-16751# National Bureau of Standards, Washington, D.C. Inst. for Computer Sciences and Technology.
TECHNOLOGY ASSESSMENT: ADP INSTALLATION PERFORMANCE MEASUREMENT AND REPORTING Final Report
Carol B. Wilson Sep. 1979 43 p refs
(PB80-101322; NBS-SP-500-53; LC-79-600154) Avail: NTIS HC A03/MF A01 CSCL 09B

The status of ADP installation performance measurement and reporting in the Federal ADP community is compared with the best practices as found in the Federal and private sectors and described in the literature. The comparison reveals that more effort could be expended by Federal sites in the area of computer performance management. The principal obstacles to more and better performance programs are perceived to be the lack of needed measures on many systems and the magnitude of the effort involved in accessing and analyzing the measures which are available. Recommendations which could partially relieve the situation include; (1) development of standard performance measures; (2) development of a Government-wide data base for normative performance ranges; and (3) development of statistical computer performance evaluation techniques. GRA

N80-16752# General Services Administration, Washington, D.C. Automated Data and Telecommunications Service.
NCR CORPORATION, IMOS COBOL: INDEXED I-O BASED X3.23-1974
9 Jan. 1979 12 p
(PB80-101868; FCTC/TR-79/02) Avail: NTIS HC A02/MF A01 CSCL 09B

A description of the evaluation environment and a summary of Indexed I-O language elements together with any errors/deviations found as a result of the evaluation are provided. GRA

N80-16753# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENTIFIC AFFAIRS, NO. 658
28 Dec. 1979 59 p Transl. into ENGLISH from various East European journals
(JPRS-74833) Avail: NTIS HC A04/MF A01

Press and radio coverage of computer, nuclear, communication, and military technologies are presented. Specific topics covered include nuclear plants, reliability indicators for computer systems, and the automation of technological processes. For individual titles, see N80-16754 through N80-16755.

N80-16754# Joint Publications Research Service, Arlington, Va.
PROCESS COMPUTER TECHNOLOGY DEVELOPMENT REVIEWED
H. Willem *In its* E. Europe Rept.: Scien. Affairs, no. 658 (JPRS-74833) 28 Dec. 1979 p 1-14 Transl. into ENGLISH from Mes. Steuren, Regeln (E. Germany) E. Berlin, v. 22, no. 10, 1979 p 550-554 (For primary document see N80-16753 07-60)
Avail: NTIS HC A04/MF A01

The use of process computer technology within the German economy is reviewed. Applications of the Robotron 4000 family to production control, laboratory and test automation, technical calculations, and information processing systems are described. System reliability and development trends are also considered. K.L.

N80-16755# Joint Publications Research Service, Arlington, Va.
RELIABILITY RATE OF COMPUTER SYSTEMS DESCRIBED
Wit Drewniak *In its* E. Europe Rept.: Scien. Affairs, no. 658 (JPRS-74833) 28 Dec. 1979 p 37-43 Transl. into ENGLISH from Informatyka (Poland), no. 7, 1979 p 5-8 (For primary document see N80-16753 07-60)
Avail: NTIS HC A04/MF A01

The reliability of the ODRA 1305, R-32, ICL 1905, and ICL 1903A computers is discussed. The mean time between two successive system failures is calculated for various periods of operation and compared to reliability standards. K.L.

N80-17019# Joint Publications Research Service, Arlington, Va.
INTERFACE ASSEMBLY FOR USE IN K 1520 SYSTEM DESCRIBED
Siegfried Wildner and Rainer Bauch *In its* E. Europe Rept.: Sci. Affairs, No. 659 (JPRS-74911) 11 Jan. 1980 p 100-109 Transl. into ENGLISH from Radio Fernsehen Elek. (E. Berlin), v. 28, no. 9, 1979 p 558-560 (For primary document see N80-17015 07-99)
Avail: NTIS HC A07/MF A01

N80-17020# Joint Publications Research Service, Arlington, Va.
MICROCOMPUTER SYSTEM K 1520 EXAMINED
Bernhard Bader *In its* E. Europe Rept.: Sci. Affairs, No. 659 (JPRS-74911) 11 Jan. 1980 p 110-128 Transl. into ENGLISH from Radio Fernsehen Elek. (E. Berlin), v. 28, no. 10, 1979 p 616-620 (For primary document see N80-17015 07-99)
Avail: NTIS HC A07/MF A01

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N80-16756 Wisconsin Univ. - Madison.
FAST ALGORITHMS FOR NP-HARD PROBLEMS WHICH ARE OPTIMAL OR NEAR-OPTIMAL WITH PROBABILITY ONE Ph.D. Thesis
Routo Terada 1979 134 p
Avail: Univ. Microfilms Order No. 7924194

Fast algorithms for six NP-hard problems are present. Thesis algorithms are shown to be optimal or near optimal with probability one. An algorithm for the Euclidean traveling salesman problem in any k-dimensional Levesque set E of zero volume boundary was designed. FOr n points independently, uniformly distributed in E, it is shown that, in probability, the time taken by the algorithm is of order less than n delta (n), as n approaches infinity for any choice of an increasing function delta (however slow its rate of increase). The resulting solution will, with probability one, be asymptotic, as n approaches infinity, to the optimal solution. Dissert. Abstr.

N80-16757 California Univ., Berkeley.
AN APPROACH TO THE REQUIREMENTS ANALYSIS AND SPECIFICATION OF LARGE-SCALE SOFTWARE SYSTEMS Ph.D. Thesis
Hon Hing So 1979 294 p

Avail: Univ. Microfilms Order No. 8000520

A framework for systematic design and development of large-scale software systems is developed with a focus on the early phases of the process. A major hypothesis made is that in order to understand the design of large-scale software, it is necessary first to identify the major transitions in its development. A total software system model should contain submodels that are built upon concepts relevant to the corresponding levels. The coherence in the submodels is ascertained by a rigorous definition of the mapping involved in the transitions. For every element of the system model, consideration is given to the suitable analysis techniques for detecting anomalies and guiding further system development. Techniques investigated include the development of a system attribute hierarchy along with the functional decomposition. The techniques developed are applied to a case study. Dissert. Abstr.

N80-16758 Stanford Univ., Calif.
FORMALIZING THE ANALYSIS OF ALGORITHMS Ph.D. Thesis
Lyle Harold Ramshaw 1979 122 p
Avail: Univ. Microfilms Order No. 8001994

Using partial correctness techniques to allow assertions that describe the probabilistic state of the executing process to be written and manipulated, program verification was extended. A formal system (called the frequency system) is presented in which the arguments can be reduced to symbol manipulation. The use of the frequency system is discussed in several average case analyses. In the examples, symbol manipulation in the frequency system leads directly to the recurrence relation that describes the distribution of the chosen performance parameter. Dissert. Abstr.

N80-16759 California Univ., Los Angeles.
CONSTRUCTIVE EXTENSION AND IMPLEMENTATION OF ABSTRACT DATA TYPES AND ALGORITHMS Ph.D. Thesis
Farshid Nourani 1979 196 p
Avail: Univ. Microfilms Order No. 8001391

The questions of specification, extension, and implementation of abstract data types and algorithms are investigated. Some algebraic techniques for proving correctness of implementations are developed in which injective morphisms of algebras play an important role. Sufficient conditions are given for such morphisms to be injective. The techniques are based on a notion of constructor signature for canonical algebras. The approach is extended to implementations of abstractly specified algorithms through a new method which first does a recursive enrichment of the concrete specification and then imposes the structure of the abstract specification onto the initial algebra for the presentation of the concrete domain. Dissert. Abstr.

N80-16760 Carnegie-Mellon Univ., Pittsburgh, Pa.
THE REPRESENTATION OF FAMILIES OF SOFTWARE SYSTEMS Ph.D. Thesis
Lee Wendell Cooprider 1978 202 p
Avail: Univ. Microfilms Order No. 7925012

A notation is developed for describing the subsystem interconnections of entire systems, the differences between versions of those systems, and the mechanisms by which the systems are constructed. This representation is the basis for the design of a software construction data base. The data base manager automatically performs system construction steps, propagates modifications to system components, and maintains construction histories. The data base user establishes invariates in the data base by attaching policies to each data base object; the policies supply a set of actions to be performed when events in the data base affect the object. An extended sample is presented to demonstrate the applicability of the representation to a real system. Several types of system construction problems are discussed, and directions for improvements to the notation outlined. Dissert. Abstr.

N80-16761 Texas Univ. at Arlington.
COMPUTATIONAL METHODS OF SYSTEM IDENTIFICATION AND PARAMETER ESTIMATION Ph.D. Thesis
Wen-Hsiu Cheng 1979 186 p
Avail: Univ. Microfilms Order No. 8001658

A computational procedure is given and numerical examples are presented using both computer simulated data and experimental data to illustrate the performance of the Direct Computational Method as well as the general method of moments. Comparison of some identification methods is provided. Application to fluorescence decay analysis and, as a case study, modeling identification of an inner gimbal assembly telescope on an airborne pointing and tracking system are discussed in detail. Dissert. Abstr.

N80-16762 Iowa State Univ. of Science and Technology, Ames.
FACTORS AFFECTING COMPUTER PROGRAM COMPREHENSION Ph.D. Thesis
John Peter Boysen 1979 125 p
Avail: Univ. Microfilms Order No. 8000118

Factors affecting the comprehension of computer programs were studied. A pilot study was conducted in which subjects were asked to hand simulate expressions and small programs presented on a computer terminal. The reaction time to indicate the hand simulation results was used as a measure of the comprehensibility of the programs and expressions. The results of the pilot study indicated that, while the reaction time methodology was acceptable for studying simple expression, a different methodology was needed to study the comprehensibility of programs. Several refinement to the methodology were also suggested. Dissert. Abstr.

N80-16763 California Univ., Los Angeles.
ADAPTATION OF SET-DEFINING NOTATION TO THE SPECIFICATION OF FORMAL LANGUAGES Ph.D. Thesis
Arie Berman 1979 201 p
Avail: Univ. Microfilms Order No. 8001383

An adaptation of set-defining notation to the specification of recursively enumerable sets of strings is defined in order to bridge the gap between the nonprocedural set-defining capability of set-defining notation and the limitations of procedural computations. Equivalent interpretations of the system are given using a familiar version of Tarski's fixed point theorem and Ginsburg and Rice's definable sets, and their equivalence is proved. The involvement of string equations is formally described, and an equivalence between arbitrary string equations and a form of set expressions is shown. Restricted interpretations and syntactic restrictions of the proposed formal system are introduced and shown to assure the involvement of only unambiguous or proper string equations. The structural relation of the proposed system to post production systems is established, and any Turing machine computation is shown to be simulated by a search through its definition in the proposed system. Dissert. Abstr.

N80-16764 Ohio State Univ., Columbus.
SOFTWARE SCIENCE AND PROGRAM COMPLEXITY MEASURES Ph.D. Thesis
Albert Louis Baker 1979 276 p
Avail: Univ. Microfilms Order No. 8001686

A program complexity measure software effort is evaluated using the analytical methodology which relies on well defined program transformations. One type of transformation used embodies principles of program modularity. The behavior of E under modularizing tranformations is in agreement with accepted principles pertaining to such program changes. When E is evaluated in light of transformations related to program control flow, its utility as a general measure of program complexity is questioned. This deficiency of E in quantifying control flow complexity motivates the analytical evaluation of other measures which purport to capture this factor. The program knots measure, K, and the normal number of a program, NN, are shown to be inadequate in certain significant respects. The graph theoretic measure cyclomatic complexity, C, is shown to be applicable to program flow graphs, and C bears up well under analytical evaluation. Dissert. Abstr.

N80-16765# Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
A VARIABLE METRIC ALGORITHM FOR THE SOLUTION OF THE SINGULAR THREE-DIMENSIONAL MISSILE AVOIDANCE
D. Blank and J. Shinar Jan. 1979 31 p refs
(Grant AF-AFOSR-3458-77)

(TAE-353) Avail: NTIS HC A03/MF A01

A variable metric algorithm is applied to the calculation of singular optimal control. A numerical example is solved to illustrate the feasibility and efficiency of the method. The results obtained show that the variable metric algorithm solves the problem in a relatively small number of iterations and short computer time. M.G.

N80-16766*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

VICAR IMAGE PROCESSING SYSTEM GUIDE TO SYSTEM USE

J. B. Seidman and A. Y. Smith 1 Dec. 1979 77 p revised (Contract NAS7-100)

(NASA-CR-162693; JPL-PUB-77-37-Rev-1) Avail: NTIS HC A05/MF A01 CSCL 09B

The functional characteristics and operating requirements of the Video Image Communication and Retrieval System are detailed. M.G.

N80-16767*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

COMPUTING REGION MOMENTS FROM BOUNDARY REPRESENTATIONS

J. M. Wilf and R. T. Cunningham 1 Nov. 1979 36 p refs (Contract NAS7-100)

(NASA-CR-162685; JPL-PUB-79-49) Avail: NTIS HC A03/MF A01 CSCL 09B

The class of all possible formulas for computing arbitrary moments of a region from the region's boundary is derived. The selection of a particular formula depends on the choice of an independent parameter. Several choices of this parameter are explored for region boundaries approximated by polygons. The parameter choice that minimizes computation time for boundaries represented by chain code is derived. Algorithms are presented for computing arbitrary moments for a region from a polygonal approximation of its boundary and for computing low order moments from chain encoded boundaries. K.L.

N80-16768*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

SYMBOLIC-NUMERIC INTERFACE: A REVIEW

Edward W. Ng 1 Jan. 1980 21 p refs (Contract NAS7-100)

(NASA-CR-162690; JPL-PUB-79-106) Avail: NTIS HC A02/MF A01 CSCL 09B

A survey of the use of a combination of symbolic and numerical calculations is presented. Symbolic calculations primarily refer to the computer processing of procedures from classical algebra, analysis, and calculus. Numerical calculations refer to both numerical mathematics research and scientific computation. This survey is intended to point out a large number of problem areas where a cooperation of symbolic and numerical methods is likely to bear many fruits. These areas include such classical operations as differentiation and integration, such diverse activities as function approximations and qualitative analysis, and such contemporary topics as finite element calculations and computation complexity. It is contended that other less obvious topics such as the fast Fourier transform, linear algebra, nonlinear analysis and error analysis would also benefit from a synergistic approach. J.M.S.

N80-16769# George Washington Univ., Washington, D. C. Inst. for Management Science and Engineering.

SYMBOLIC FACTORABLE SUMT: WHAT IS IT, HOW IS IT USED

Abolfazl Ghaemi and Garth P. McCormick 25 May 1979 113 p refs

(Contract N00014-75-C-0611)

(AD-A074903; Serial-T-408) Avail: NTIS HC A06/MF A01 CSCL 12/1

This report is intended to serve as a guide for coding, solving, and conducting sensitivity and elasticity analysis on a solution vector of general parametric nonlinear programming problems using the latest version of the computer programming model of Symbolic Factorable SUMT. The motivation for development of this model, which uses symbolic factorable input, and the process of its evolution is briefly reviewed. The relative merits and advantages of this model over its earlier versions, as well as over the SUMT-Version 4 model 1 is elaborated. The procedure for putting problems into symbolic factorable language that is digestible by the model, and the related model outputs, are fully explored. For illustrative purposes three increasingly difficult sample problems are coded, solved, and discussed in sufficient detail. For completeness, the theory of symbolic factorable sensitivity analysis that was developed in 4 is included as an appendix. GRA

N80-16770# Technology Service Corp., Santa Monica, Calif.

COMPUTER IMAGE GENERATION TEXTURE STUDY Final Report

Tony Stenger, William Dungan, and Richard Reynolds Aug. 1979 73 p refs

(Contract F33615-77-C-0063; AF Proj. 6114)

(AD-A074019; AFHRL-TR-79-2) Avail: NTIS HC A03/MF A01 CSCL 12/1

This development project resulted from the need to enhance visual flight simulators (based on computer image generation (CIG) techniques) with textured surfaces. Pilots viewing homogeneous surfaces experience an inadequate perception of motion above these surfaces as well as an ambiguity in the orientation of the surface. Therefore, it was felt that by using textured surfaces within the scene, both depth and motion cues would be made available. This report describes the approaches and techniques used to develop texture material and introduce it into a complex CIG scene. The approach is to create texture tile arrays of trees and grass from digitized photographs of natural texture. These arrays are then replicated over the surface in the fashion of tiles. Preprocessing techniques are described which eliminate the periodic effect due to the tile boundary and macropatterns within the tile itself. Level-of-detail texture tile arrays are created that match the resolution of the texture to the appropriate observer-scene viewing geometry. The level-of-detail arrays and other descriptive parameters are merged into the existing CIG software to produce textured images. Scenes depicting a landing sequence, a divebomb, and a low-altitude flight were then generated. These images show the effect of the varying levels of detail, fields of viewing geometries, and scene deriving distance and motion cues from the additional information contained in the textured images. GRA

N80-16771# Maryland Univ., College Park.

A COMPARISON OF SOME SIMPLE METHODS FOR EXTRACTING TEXTURE PRIMITIVES AND THEIR EFFECTIVENESS IN TEXTURE DISCRIMINATION

Shyuan Wang, Flavio R. D. Velasco (Inst. de Perquisas Espaciais, Sao Paulo, Brazil), and Azriel Rosenfeld Apr. 1979 34 p refs (Grant AF-AFOSR-3271-77; AF Proj. 2304)

(AD-A073956; TR-759; AFOSR-79-0966TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Three simple methods of extracting texture primitives are compared. It appears that the simplest of these, thresholding at a fixed percentile, yields primitives that are quite effective in texture discrimination. GRA

N80-16772# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.

SOME N BY DN LINEAR COMPLEMENTARITY PROBLEMS SOLVABLE BY A PRINCIPAL PIVOTING ALGORITHM WITH APPLICATIONS

Ikuyo Kaneko and Jong-Shi Pang Apr. 1979 40 p refs Prepared in cooperation with Wisconsin Univ. - Madison

(Contract N00014-75-C-0621; Grant NSF ENG-77-11136; RR0140701)

(AD-A073929; MSRR-435; WP-59-78-79) Avail: NTIS HC A03/MF A01 CSCL 12/1

The purpose of this paper is to study some recent applications of the n by dn LCP solvable by a parametric principal pivoting algorithm (PPP algorithm). First, it is shown that by analyzing the n by dn LCP we could study the problem of solving a system of equations and the (nonlinear) complementarity problem when the function involved is separable. Next, we examine conditions under which the PPP algorithm is applicable to a general LCP, and then present examples of LCP's arising from various applications satisfying the conditions; included among them is the n by dn LCP with a certain P-property. Finally we study a special class of n by dn LCP's which do not possess

the P-property but to which the PPP algorithm is still applicable; a major application of this class of problems is a certain economic spatial equilibrium model with piecewise linear prices. GRA

N80-16773# California Univ., Livermore. Lawrence Livermore Lab. Dept. of Hazards Control.
BIOSAY: A COMPUTER PROGRAM TO STORE AND REPORT BIOASSAY DATA
G. E. Williams and J. R. Partagreco Dec. 1978 16 p
(Contract W-7405-eng-48)
(UCID-17989) Avail: NTIS HC A02/MF A01

A computer program designed to manipulate bioassay data is presented. The program contains a data sorting option which allows all the results for particular individuals, or groups of individuals with common attributes, to be separated from the data base. The computer code is written in a conversational tone with aids which make it usable by even casual users of the computer system. DOE

N80-16774# SRI International Corp., Menlo Park, Calif.
ON-LINE PROGRAMMER'S MANAGEMENT SYSTEM Final Technical Report, Sep. 1977 - Mar. 1979
Bruce L. Parsley, Harvey G. Lehtman, and Susan Kahn Aug. 1979 72 p refs
(Contract F30602-77-C-0185; AF Proj. 5581)
(AD-A074468; RADC-TR-79-205) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report is composed of studies that have been conducted to develop the NLS system as an on-line programming environment and to provide an on-line JOVIAL interactive debugger with the capabilities to debug JOVIAL language programs. The final report contains several design additions to the NLS system to create an on-line programming environment. A JOVIAL User's Guide prepared in Addendum Technical Report I provides an extensive set of commands for using the JDAD Debugger. Adendum Technical Report II provides a generalized approach to debugging and describes the NLS/NSW Do-All Debugger (DAD). GRA

N80-16775# Augmentation Resources Center, Cupertino, Calif.
ON-LINE PROGRAMMER'S MANAGEMENT SYSTEM. ADDENDUM 1: USER'S GUIDE TO THE JOVIAL DEBUGGER Final Technical Report, Sep. 1977 - Mar. 1979
Bruce L. Parsley, Harvey G. Lehtman, and Susan Kahn Griffiss AFB, N.Y. RADC Aug. 1979 96 p
(Contract F30602-77-C-0185; AF Proj. 5581)
(AD-A074495; RADC-TR-79-205-Add-1) Avail: NTIS HC A05/MF A01 CSCL 09/2

This report is composed of studies that have been conducted to develop the NLS system as an on-line programming environment and to provide an on-line JOVIAL interactive debugger with the capabilities to debug JOVIAL language programs. The final report contains several design additions to the NLS system to create an on-line programming environment. A JOVIAL User's Guide prepared in Addendum Technical Report I provides and extensive set of commands for using the JDAD Debugger. GRA

N80-16776# SRI International Corp., Menlo Park, Calif.
ON-LINE PROGRAMMER'S MANAGEMENT SYSTEM. ADDENDUM 2: PROGRAMMER'S GUIDE TO THE DEBUGGER Final Report, Sep. 1977 - Mar. 1979
Bruce L. Parsley, Harvey G. Lehtman, and Susan Kahn Aug. 1979 215 p
(Contract F30602-77-C-0185; AF Proj. 5581)
(AD-A074496; RADC-TR-79-205-Add-2) Avail: NTIS HC A10/MF A01 CSCL 09/2

A generalized approach to debugging is given. The NLS/NSW Do-All debugger (DAD) is described. GRA

N80-16777# Oak Ridge National Lab., Tenn.
FORTRAN SUBROUTINES FOR BICUBIC SPLINE INTERPOLATION
P. W. Gaffney Jul. 1979 33 p refs
(Contract W-7405-eng-26)
(ORNL/CSD/TM-67) Avail: NTIS HC A03/MF A01

FORTRAN subroutines for computing a bicubic spline function which interpolates values of a function u on a rectangular grid are presented. DOE

N80-16778# Argonne National Lab., Ill.
ITERATIVE SOLUTION OF LINEAR PROGRAMS
O. L. Mangasarian Jul. 1979 26 p refs
(Contract W-31-109-eng-38)
(ANL-79-75) Avail: NTIS HC A03/MF A01

By perturbing a linear program to a quadratic program, it is possible to solve the latter in its dual variable space by iterative techniques such as successive over-relaxation methods. This solution provides a solution to the original linear program. DOE

N80-16779# Los Alamos Scientific Lab., N. Mex.
MINICOMPUTER-BASE INTERACTIVE IMAGE PROCESSING
J. R. Breedlove, Jr. and S. T. Alexander 1979 8 p refs
Presented at the 1st Intern. Micro and Mini Computer Conf. and Exposition, Houston, Tex., 14 Nov. 1979
(Contract W-7405-eng-36)
(LA-UR-79-1912; CONF-791104-2) Avail: NTIS HC A02/MF A01

A mini-computer-based system for interactive image processing and interactive reduction of data from photographs, radiographs, and other image-like information is presented. This system, Digital Image Analysis and Display System (DIADS), represents an efficient alternative to existing supercomputer-based image processing for most problems. DIADS consists of two linked minicomputers with conventional computer peripherals, special tricolor image processing hardware, and extensive supporting software for handling large arrays of data. DIADS is described, and examples of image processing and image analysis results are shown. DOE

N80-16780# Argonne National Lab., Ill.
THE DEVELOPMENT AND APPLICATION OF ENVIRONMENTAL MAPPED DATA DIGITIZATION, ENCODING, ANALYSIS, AND DISPLAY SOFTWARE FOR THE ALICE SYSTEM, VOLUME 1 Interim Report
L. W. Amiot, R. J. Lima, S. D. Scholbrock, C. B. Shelman, and R. H. Wehman Jun. 1979 60 p refs
(Contract W-31-109-eng-38)
(ANL-79-71-Vol-1) Avail: NTIS HC A04/MF A01

The ALICE system is described along with the software developed for the processing of mapped environmental information used in city and regional planning, environmental analysis, energy assessment, and resource management. DOE

N80-16781# Oak Ridge National Lab., Tenn.
PIE: A FORTRAN SUBROUTINE FOR PLOTTING CIRCLES, CONCENTRIC CIRCLES, PIE CHARTS, AND SHADED PIE CHARTS
C. A. Dillard Oct. 1979 18 p
(Contract W-7405-eng-26)
(ORNL/CSD/TM-82) Avail: NTIS HC A02/MF A01

A set of FORTRAN subroutines designed to draw circles, concentric circles, pie charts, and shaded pie charts is described. These subroutines run on IBM/360 computers and the PDP-10 Subroutine PLOT is the only plotting routine used; thus, drawings can be made on Versatec, Calcomp, or Tektronix plotters. DOE

N80-16782# California Univ., Livermore. Lawrence Livermore Lab.
EXPALS: FORTRAN CODE FOR EXPONENTIAL APPROXIMATION BY LEAST SQUARES
C. D. Gardner 1 Aug. 1978 47 p
(Contract W-7405-eng-48)
(UCRL-14541-Rev-2) Avail: NTIS HC A03/MF A01

A FORTRAN program for obtaining a weighted least squares fit of a sum of exponentials to be run on CDC 6600 or CDC 7600 computers is described. This routine fits a linear combination of real exponential decay functions by the Prony-Householder iteration method. The mathematics and programming involved in EXPALS are presented. Also included are output of examples to test the program. DOE

N80-16783# California Univ., Livermore. Lawrence Livermore Lab.
DATA FLOW COMPUTING: SOFTWARE DEVELOPMENT
R. McGraw 23 Jul. 1979 11 p refs Presented at the Distributed Computing Systems Conf., Huntsville, Ala., 1-4 Oct. 1979

(Contract W-7405-eng-48)
(UCRL-83026; CONF-791012-1) Avail: NTIS HC A02/MF A01

The problem of language design for a data flow environment is presented. Several alternatives are surveyed for a data flow language and then one specific effort is considered: MIT VAL. This language stresses implicit concurrency. Both programmer and translator can easily identify and exploit concurrency because VAL disallows all forms of side-effects and aliasing. An analysis of the language and areas of continued research is given. While substantial progress is made, much remains to be done in the areas of language design, translation, and use. DOE

N80-16784# Sandia Labs., Albuquerque, N. Mex.
COMPARISON OF NONLINEAR LEAST SQUARES SOFTWARE
K. L. Hiebert Aug. 1979 45 p refs
(Contract EY-76-C-04-0789)
(SAND-79-0483) Avail: NTIS HC A03/MF A01

The comparison of twelve readily available FORTRAN codes (E04GAF, E04FAF, LMDER, LMDIF, ISQFDN, LSQFDQ, LSQNDN, NL2SOL, NS03A, SNWT, TJMAR1, ZXSSQ) which solve unconstrained nonlinear least-squares problems is presented. A set of 36 problems reported in the literature was used. To the extent possible, the parameters for the copes were set so as to have the codes solve equivalent problems. However, no code changes were made to achieve this goal. To test the robustness of the codes the initial starting value of the variables and the scaling of both the functions and the variables were varied. While measurements of efficiency such as the number of function evaluations and/or Jacobian evaluations and relative time were recorded, conclusions were based on the reliability of the codes. DOE

62 COMPUTER SYSTEMS

Includes computer networks.

N80-16785 Wisconsin Univ. - Madison.
THE DESIGN AND IMPLEMENTATION OF USER ORIENTED SYSTEMS Ph.D. Thesis
Nathan Relles 1979 195 p
Avail: Univ. Microfilms Order No. 7924190

A taxonomy of user-oriented features of computer systems is developed, consisting of on-line aids, alternative modes of communication, defaults, language extensibility, and effective language design. A set of operating system capabilities is proposed to simplify and encourage the provision of user aids. A set of primitives realigning these capabilities was implemented in the form of a user interface that enables any system to provide user aids consistently, efficiently, and in an unobtrusive manner. An experiment was conducted to investigate the relationships among on-line aids, user performance, and ease of use. The user interface served both as an instrument and object of evaluation. In the first sense, the interface was used to implement the different forms of assistance under study and to monitor their use. At the same time, properties of the interface were evaluated with respect to their effect on ease of use and the effort required to incorporate on-line aids into a program.
Dissert. Abstr.

N80-16786# California Univ., Livermore. Lawrence Livermore Lab.
CORRECTING THE PLOTTING SYMBOL POSITIONING ERROR IN TEKTRONIX'S GRAPH PLOT 50 SOFTWARE (4050A07 SERIES B)
L. B. Owen 6 Aug. 1979 11 p
(Contract W-7405-eng-48)
(UCID-18234) Avail: NTIS HC A02/MF A01

A simple modification to the Graph Plot 50 software, devised for eliminating the symbol positioning error, is described. The eight most frequently used plotting symbols are automatically compensated to insure proper positioning when output is created on either the series 4050 screen display or the 4662 plotter. Other keyboard characters can be used as plotting symbols, if desired, but automatic positioning compensation is not provided. DOE

N80-16787# National Bureau of Standards, Washington, D.C. Inst. of Computer Sciences and Technology.
COMPUTER SCIENCE AND TECHNOLOGY: A KEY NOTARIZATION SYSTEM FOR COMPUTER NETWORKS Final Report
Miles E. Smid Oct. 1979 39 p refs
(PB80-104698; NBS-SP-500-54; LC-79-600160) Avail: NTIS HC A03/MF A01 CSCL 09B

A cryptographic key notarization system is proposed for computer networks to protect personal (nonshared) files, to communicate securely both on and off-line with local and remote users, to protect against key substitution, to authenticate system users, to authenticate data, and to provide a digital signature capability using a nonpublic key encryption algorithm. The system is implemented by the addition of key notarization facilities which give users the capability of exercising a set of commands for key management as well as for data encryption functions. Key notarization facilities perform notarization which, upon encryption, seals a key or password with the identities of the transmitter and intended receiver. GRA

N80-16788# University Coll., London (England). Dept. of Statistics and Computer Science.
INVESTIGATION OF REQUIREMENTS AND IMPLEMENTATION OF FACILITIES FOR CONNECTING UK HOSTS TO EURONET Final Report
P. L. Higginson and P. T. Kirstein Jul. 1979 29 p refs
(BLL-BLRDR-5508) Avail: British Library Lending Div., Boston Spa, Engl.

Topics covered include (1) the LSI-2 test host hardware; (2) design of the X25 software and its interface; (3) protocol design; (4) support facilities and testing aids; (5) development and testing of the test host software; (6) black box problems; and (7) advisory and related activities. A.R.H.

N80-16789# University Coll., London (England). Dept. of Statistics and Computer Science.
FACSIMILE TECHNIQUES FOR ON-LINE COMPUTER NETWORKS Final Report
Peter T. Kirstein Feb. 1979 14 p refs
(BLL-BLRDR-5506; INDRA-TR-79-54) Avail: British Library Lending Div., Boston Spa, Engl.

A facsimile communication technique called 'store and inform' is proposed and demonstrated to be feasible over a real packet switched data network. A method for building a replicable system to run over the commercial packet switched data networks is given. An economic analysis of the system shows it to be reasonably attractive. K.L.

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N80-17018# Joint Publications Research Service, Arlington, Va.
MICROCOMPUTER-BASED CNC 600 NUMERICAL CONTROL SYSTEM DESCRIBED
Guenter Wollenberg *In its* E. Europe Rept.: Sci. Affairs, No. 659 (JPRS-74911) 11 Jan. 1980 p 77-99 refs Transl. into ENGLISH from Radio Fernsehen Elek. (E. Berlin), v. 28, no. 11 1979 p 694-700 (For primary document see N80-17015 07-99) Avail: NTIS HC A07/MF A01

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N80-16790 Washington Univ., Seattle.
CLASSES OF NON-COMMUTATIVE RINGS WITH DEDE-

KIND DOMAIN-LIKE PROPERTIES AND MODULE OVER NON-COMMUTATIVE VALUATION RINGS Ph.D. Thesis
Bo-Yuan Chiu 1979 75 p
Avail: Univ. Microfilms Order No. 8002440

A notion of 'radial' of an ideal is introduced for right Noetherian polynomial identity rings and it is shown that in Noetherian dedekind orders, every primary ideal is a power of its radical, and that primary decompositions exist in Noetherian prime PI-rings. Classes of prime polynomial identity rings related to the dedekind rings and the relation of these classes, one to another, are investigated. These include ZPI-rings, multiplication rings, and weak multiplication rings. A weak cancellation property of ideal arithmetic is introduced, under which it is shown that for Noetherian rings the weak multiplication property implies the ZPI property, and that the classes of multiplication rings and weak multiplication rings are identical. Modules over some of the classes of rings are studied, and several generalizations of classical results about modules over the commutative specializations are discovered to hold. Dissert. Abstr.

N80-16791 Texas Univ. at Austin.
SMOOTH GROUP ACTIONS OF PRIME ORDER AND FIXED POINT SETS Ph.D. Thesis
Gary Alan Krause 1979 69 p
Avail: Univ. Microfilms Order No. 7928315

Given an odd prime action on a manifold, there are many different ways to orient the fixed set systematically which depend only on the prime and the ambient manifold. For certain actions, the signatures of the manifold and of the fixed set must be congruent modulo four for at least one of these orientation systems. An approach (using the structure of bordism rings of orientation preserving actions on closed smooth manifolds) to generalizing this congruence to all such orientation systems is indicated. It is shown that the generalization is true for generators of these rings. Dissert. Abstr.

N80-16792 Stanford Univ., Calif.
THE DIRICHLET PROBLEM FOR QUASILINEAR ELLIPTIC EQUATIONS WITH LOWER REGULARITY AT THE BOUNDARY Ph.D. Thesis
Gary Mitchell Lieberman 1979 111 p
Avail: Univ. Microfilms Order No. 8001959

Solutions to the Dirichlet problem for quasi-linear elliptic, second order partial differential equations, i.e., classical solutions of these equations in a bounded n-dimensional domain with prescribed values on the boundary of the domain are considered. Results indicate that under appropriate hypotheses on the equation and the domain, the boundary gradient estimate holds for arbitrary boundary values which are continuously differentiable with Holder continuous first derivatives. Dissert. Abstr.

N80-16793 California Univ., Berkeley.
TRANSFORMATIONAL STRUCTURE OF ALGEBRAIC LOGICS Ph.D. Thesis
Richard Joseph Thompson 1979 345 p
Avail: Univ. Microfilms Order No. 8000540

A general approach to algebraic logic (in the restricted sense of algebraic theories adequate for investigating predicate logic-such as cylindric algebras and polyadic algebras) is presented. Given a variety of algebras, the members of which have Boolean algebras as reducts, the problem arises of showing that all nontrivial members of the variety (or all members of a subclass with a simple algebraic formulation) are subdirect products of certain concrete Boolean set algebras, to which other concrete operations have been adjoined. Dissert. Abstr.

N80-16794 Stanford Univ., Calif.
INFLUENCE FUNCTIONS FOR CENSORED DATA Ph.D. Thesis
Nancy Margaret Reid 1979 41 p
Avail: Univ. Microfilms Order No. 8001996

Influence curves of censored data estimators are considered. The influence curve is a function used in the theory of robust estimation both as a qualitative description of the robustness of an estimator and as a tool for calculating its asymptotic variance. The influence curve of the Kaplan-Meier estimate was calculated. It is shown that the influence curve provides an alternative derivation of the asymptotic variance of this estimate. The regularity conditions required to make this derivation rigorous were verified in the appendix. A chain rule for influence curves was established and was used to calculate the influence curves of censored data estimators that were functions of the Kaplan-Meier estimate. The robustness properties and asymptotic variances of these estimates follow directly. Some examples of this unified approach to calculating variances are given. Dissert. Abstr.

N80-16795 California Univ., Berkeley.
AN EXTENSION OF STRASSEN'S LAW AND SOME PROBABILISTIC RESULTS IN COMPLEX ANALYSIS Ph.D. Thesis
Carl Eric Mueller 1979 63 p
Avail: Univ. Microfilms Order No. 8000452

Several problems concerning Brownian motion and diffusion processes were investigated. A general theorem which contains two of the leading results about Brownian motion are Strassen's version of the law of the iterated logarithm and Levy's modulus of continuity for Brownian paths is proved. For both the law of the iterated logarithm and Levy's modulus, tests for upper and lower functions are known. These results are also shown to be corollaries of a single theorem. The BMO and BMO sub Rho spaces are characterized in terms of the stopping times of Brownian motion. This result resolves a conjecture of Sarason by characterizing BMO sub Rho in terms of Carleson measures. A probabilistic proof of a criterion for BMO due to Hayman and Pommerenke is given. Dissert. Abstr.

N80-16796 Iowa State Univ. of Science and Technology, Ames.
VARIANCE APPROXIMATIONS FOR ESTIMATORS OF FIXED AND RANDOM EFFECTS IN MIXED LINEAR MODELS Ph.D. Thesis
Raghu Nath Kackar 1979 171 p
Avail: Univ. Microfilms Order No. 8000143

The approximate variance formula involved the variances and the covariances of the variance component estimators. Approximate variances and covariances for the Maximum Likelihood and Restricted Maximum Likelihood estimators of the variance components are derived. The computation of these approximate variances and covariances involved evaluating central product moments of quadratic forms of normally distributed random vectors up to the fourth order. Alternative estimation procedures are derived by applying Bayesian concepts. Approximate procedures for interval estimation are also considered. The performance of the approximate variance formula was investigated numerically in the context of estimation of treatment contrasts in balanced incomplete block designs. Dissert. Abstr.

N80-16797 Stanford Univ., Calif.
CONSISTENT NONPARAMETRIC ESTIMATION OF BEST LINEAR CLASSIFICATION RULES/SOLVING INCONSISTENT SYSTEMS OF LINEAR INEQUALITIES Ph.D. Thesis
Richard Lee Greer 1979 294 p
Avail: Univ. Microfilms Order No. 8001930

A nonenumerative algorithm called the tree algorithm is presented which consistently estimates from training sample data those decision rules which are best in a fixed class of linear decision rules for classifying an observation vector into one of two multivariate distributions. The loss function used to define what is meant by a best classification rule is essentially any reasonable statistical measure of loss or in more precise terms, it is a function of the rule only through its misclassification probabilities and it is a nondecreasing function of those. The Bayes, Minimax, and Neyman-Pearson loss functions are included as well as new or relatively unnoticed loss functions derived from norms of the vector of misclassification probabilities. Dissert. Abstr.

N80-16798* Technion - Israel Inst. of Tech., Haifa. Dept. of Aeronautical Engineering.
OUTPUT ENSEMBLE AVERAGE OF PERIODICALLY EXCITED LINEAR TIME-VARYING SYSTEMS
E. Besner and J. Shinar May 1979 22 p refs

(TAE-372) Avail: NTIS HC A02/MF A01

Calculation of the mean square ensemble average of the nonstationary output of a linear time-varying system excited by a periodical random input is carried out by a direct method. Results can be obtained by a closed form solution or in a single computer run. The applicability of the method is illustrated using a missile intercept problem. Author

N80-16799*# Virginia Univ., Charlottesville. School of Engineering and Applied Science.

ANALYSIS AND TESTING OF NUMERICAL FORMULAS FOR THE INITIAL VALUE PROBLEM

R. Leonard Brown, Kurt R. Kovach, and Jeffrey L. Popyack Jan. 1980 95 p refs

(Grant NsG-1335)

(NASA-CR-162655; UVA-528149-AMCS80-101) Avail: NTIS HC A05/MF A01 CSCL 12A

Three computer programs for evaluating and testing numerical integration formulas used with fixed stepsize programs to solve initial value systems of ordinary differential equations are described. A program written in PASCAL SERIES, takes as input the differential equations and produces a FORTRAN subroutine for the derivatives of the system and for computing the actual solution through recursive power series techniques. Both of these are used by STAN, a FORTRAN program that interactively displays a discrete analog of the Liapunov stability region of any two dimensional subspace of the system. The derivatives may be used by CLMP, a FORTRAN program, to test the fixed stepsize formula against a good numerical result and interactively display the solutions. K.L.

N80-16800# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Mathematics and Statistics.

CONFIDENCE INTERVALS FOR THE COMMON VARIANCE OF EQUICORRELATED NORMAL RANDOM VARIABLES

P. F. Ramig and S. Zacks 1 Aug. 1979 33 p refs

(Contract N00014-75-C-0529; NR Proj. 042-276)

(AD-A074339; TR-37) Avail: NTIS HC A02/MF A01 CSCL 12/1

Confidence intervals for the common variance of equicorrelated normal random variable are investigated. When the correlation coefficient is unknown no uniformly most accurate invariant confidence interval for the common variance exists. We develop interval estimators which are based on the asymptotically most efficient ones by employing the best asymptotic normality of the maximum likelihood estimators. In addition to their comparison with possible competitors, their small sample efficiency is studied. A method for determining exact coverage probabilities and expected length is developed. As a result of these investigations we concluded that interval estimators based on maximum likelihood estimators are to be recommended. GRA

N80-16801# Naval Underwater Systems Center, New London, Conn.

GENERALIZED ADAMS METHODS

Ding Lee 6 Jul. 1979 51 p refs

(ZR0000101)

(AD-A074548; NUSC-TR-6011) Avail: NTIS HC A04/MF A01 CSCL 12/1

It is most desirable to use an accurate numerical method that allows the use of a large step size to solve stiff initial value problems. A family of generalized Adams-Bashforth and generalized Adams-Moulton methods, which we call GAB-GAM, are shown to be derived from nonlinear multistep (NLMS) methods. GAB-GAM methods are found to have advantages in solving (1) stiff equations; and (2) a class of underwater acoustic wave propagation problems. An application of these methods is included in this report. Also, an ANSI FORTRAN program, together with a set of numerical test examples, is included. GRA

N80-16802# Naval Postgraduate School, Monterey, Calif.

NUMERICAL INVERSION OF LAPLACE TRANSFORMS M.S. Thesis

John Hollis Duncon Jun. 1979 192 p refs

(AD-A074438) Avail: NTIS HC A09/MF A01 CSCL 12/1

Inversion of Laplace transforms has been accomplished by a numerical integration along appropriate paths in the complex plane. Two general procedures have been used. The simpler and more economical employs a simple path, such as a parabola, which bends to the left. Accuracy is maintained by monitoring the oscillation of the integrand. A second method employs a steepest descent contour. GRA

N80-16803# Stanford Univ., Calif. Dept. of Operations Research.

ON Q-MATRICES, CENTROIDS AND SIMPLOTOPES

Richard W. Cottle and Rabe VonRandow Jun. 1979 38 p refs

(Contracts N00014-75-C-0267; Grant NSF MCS-76-81259)

(AD-A074959; SU-TR-79-10) Avail: NTIS HC A03/MF A01 CSCL 12/1

A necessary condition for a set of spherical (n-1)-simplicies to cover the sphere S(n-1) in R(n) is established. It is shown that the condition is also sufficient when $n = 2$ but is not so when $n > 2$. The result is viewed as a property of Q-matrices, which arise in connection with the linear complementarity problem. A partitioning theorem for a particular type of convex body known as a simplotope (the cartesian product of two simplices) is proved along with a theorem which states that the centroid of a suitable defined spherical sector has a positive inner product with each nonzero element of the sector. J.M.S.

N80-16804# Stanford Univ., Calif. Dept. of Engineering-Economic Systems.

OPTIMAL INFORMATION ACQUISITION FOR RANDOMLY OCCURRING DECISIONS

Alimohammad Sharifnia Sep. 1979 154 p refs

(Contract N00014-79-C-0036)

(AD-A074956; SU-EES-DA-79-1) Avail: NTIS HC A08/MF A01 CSCL 12/1

This research investigates the information acquisition policies for randomly occurring decisions. A randomly occurring decision is a decision that must be made upon the occurrence of a precipitating event that occurs randomly with time. Due to the urgency often associated with this type of decision, it is difficult to obtain fresh information at the time of the decision. Therefore, the available information will be limited to the unfresh (old) information from the past. Since the information becomes outdated and obsolete in time, regular updating of the information is often desirable in order to be prepared for the decision. GRA

N80-16805# Michigan State Univ., East Lansing. Dept. of Statistics and Probability.

ASYMPTOTIC NORMALITY OF A VARIANCE ESTIMATOR OF A LINEAR COMBINATION OF A FUNCTION OF ORDER STATISTICS

Joseph C. Gardiner and Parab Kumar Sen Jul. 1979 25 p refs Revised Prepared in cooperation with North Carolina Univ.

(Contract N00014-79-C-0522)

(AD-A074846; RM-389-Rev) Avail: NTIS HC A02/MF A01 CSCL 12/1

An estimator of the asymptotic variance of (a randomly stopped) linear combination of a function of order statistics is considered and its asymptotic normality is studied under appropriate regularity conditions. A comparative study of the regularity conditions pertaining to the asymptotic normality and strong convergence of linear combinations of functions or order statistics and their estimated asymptotic variances is also made. GRA

N80-16806# Stanford Univ., Calif. Dept. of Computer Science.

FAST ALGORITHMS FOR SOLVING PATH PROBLEMS

Robert Endre Tarjan Apr. 1979 50 p refs

(Contracts N00014-76-C-0688; NSF MCS-75-22870)

(AD-A074079; SU-STAN-CS-79-734) Avail: NTIS HC A03/MF A01 CSCL 12/1

Let G = (V,e) be a directed graph with a distinguished source vertex. The single source path expression problem is to find, for each vertex v, a regular expression P(s,v) which represents the set of all paths in G, from s to v. A solution to this problem can be used to solve shortest path problems, solve sparse systems of linear equations, and carry out global flow analysis. A method which computes path expressions by dividing G into components, computing path expressions on the components by Gaussian

elimination, and combining the solutions is described. This method requires O(m alpha(m,n)) time on a reducible flow graph, where n is the number of vertices in G, m is the number of edges in G, and alpha is a functional inverse of Ackermann's function. The method makes use of an algorithm for evaluation functions defined on paths in trees. A simplified version of the algorithm, which runs in O(m log n) time on reducible flow graphs, is quite easy to implement and efficient in practice. J.M.S.

N80-16807# Rutgers - The State Univ., New Brunswick, N. J.
QUALITATIVE STUDY OF NONLINEAR PROBLEMS IN ANALYSIS Final Technical Report, 1 Jan. 1966 - 30 Jun. 1979
Jane Cronin Scanlon 30 Aug. 1979 12 p refs
(Contract DAHC04-75-C-0148; Grants DA-ARO(D)-31-124-G784; DA-ARO(D)-31-124-G1098; DA-ARO(D)-31-124-72-G69)
(AD-A074017; ARO-6131.25-M; ARO-12981.2-M; FTR-1) Avail: NTIS HC A02/MF A01 CSCL 12/1

The objective of the work was to use qualitative methods, especially fixed point theorems and topological degree, to study nonlinear problems in analysis. Existence of solutions of wide classes of abstract nonlinear functional equations are established and the existence of recurrent and period solutions of nonlinear ordinary differential equations are obtained. Upper bounds for the number of such solutions are also obtained. (Such upper bounds for the number of periodic solutions of nonlinear ordinary differential equations have become significant in mathematical studies of chemical reactions.) Several results in the stability of periodic solutions of nonlinear ordinary differential equations were also established. Several mathematical problems which arise in physiology were studied. The most specific conclusion obtained is a clinical recommendation for the treatment of patients suffering from a rupture of an aneurysm of the circle of Willis. Finally, two books have been written: a textbook on qualitative theory of ordinary differential equations and a set of lecture notes on the mathematics of cell electrophysiology. GRA

N80-16808# Michigan Univ., Ann Arbor. Dept. of Electrical and Computer Engineering.
VECTORIZED SPARSE EXAMINATION Interim Report
D. A. Calahan Aug. 1979 13 p refs Presented at the Sci. Computer Inform. Exchange Meeting, Livermore, Calif., 12-13 Sep. 1979
(Grant AF-AFOSR-2812-75; AF Proj. 2304)
(AD-A074091; AFOSR-79-0980TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Vectorizable sparse equation solution algorithms are classified by the matrix structure which they favor. The state-of-the-art for solution of relatively dense systems is then reviewed. A hybrid vector construct is defined for the increasingly common structure of both moderate local matrix density and global matrix regularity. Estimates are made of CRAY-1 speedup achievable with this construct. A finite difference matrix is studied as an example. GRA

N80-16809# Sandia Labs., Albuquerque, N. Mex. Safeguards Evaluation Div.
USING SETS TO FIND MINIMAL CUT SETS IN LARGE FAULT TREES
R. B. Worrell and D. W. Stack 1978 22 p Presented at the CUBE Symp., Los Alamos, N. Mex., 4 Oct. 1978
(Contract EY-76-C-04-0789)
(SAND-78-1943C; CONF-781024-3) Avail: NTIS HC A02/MF A01

An efficient algebraic algorithm for finding the minimal cut sets for a large fault tree was defined and a new procedure which implements the algorithm was added to the Set Equation Transformation System. The algorithm includes the identification and separate processing of independent subtrees, the coalescing of consecutive gates of the same kind, the creation of additional independent subtrees, and the derivation of the fault tree stem equation in stages. The computer time required to determine the minimal cut sets using these techniques is substantially less than the computer time required to determine the minimal cut sets when these techniques are not employed. It is shown for a given example that the execution time required to determine the minimal cut sets can be reduced from 7,686 seconds to 7 seconds when all of these techniques are employed. DOE

N80-16810# Illinois Univ., Urbana. Dept. of Computer Science.
THE 1979 SIGNUM MEETING ON NUMERICAL ORDINARY DIFFERENTIAL EQUATIONS
R. D. Skeel Apr. 1979 137 p refs Meeting held at Urbana, Ill., 3 Apr. 1979
(Contract EY-76-S-02-2383; Grant NSF MCS-78-20007)
(COO-2383-0058; UIUCDCS-R-79-963; UILU-ENG-79-1710; CONF-790403) Avail: NTIS HC A07/MF A01

Theory, algorithms, software, and applications related to ordinary differential equations are discussed. Specific topics addressed include stiff differential systems, the method of lines, the stability properties of linear multistep and time discretization methods, and the initial value problem. K.L.

N80-16811# Stanford Univ., Calif. Dept. of Statistics.
ESTIMATION OF RANDOM FIELDS FROM NETWORK OBSERVATIONS
A. F. Cabannes Sep. 1979 128 p refs
(Contract EY-76-S-02-2874)
(COO-2874-54; SU-TR-26) Avail: NTIS HC A07/MF A01

The problem of estimating a random field at points where there are no observations is considered. The study of methods of estimation and the problem of network design are addressed. DOE

N80-16812# Massachusetts Inst. of Tech., Cambridge. Constructed Facilities Div.
COMPUTATION OF HANKEL TRANSFORMS USING THE FAST-FOURIER TRANSFORM ALGORITHMS
E. Kausel and G. Bouckovalas Aug. 1979 49 p refs
(Grant NSF ENV-77-18339)
(PB80-104045; R79-12; NSF/RA-790206) Avail: NTIS HC A03/MF A01 CSCL 12A

An efficient numerical procedure is presented for the computation of Hankel transforms. The algorithm is based on the expression of the Hankel transform in terms of a two dimensional Fourier transform, which is then reduced to only one dimension. The latter is then evaluated with the fast Fourier transform algorithm. Examples are presented, and a listing of the computer program included. GRA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N80-16813 Georgia Univ., Athens.
LINEAR AND NONLINEAR STOCHASTIC OPERATORS Ph.D. Thesis
Kourken Malakian 1979 153 p
Avail: Univ. Microfilms Order No. 8001019

The error due to closure approximation in hierarchy equations is computed and interpreted through convenient matrix representations developed for both the inverse method and the closure approximations in hierarchy equations. Using the inverse method, improved solutions are developed which accelerate the rate of convergence of the iterative series to different orders. A physical interpretation is given to the improved solutions which gives a better insight into the relationships between the theory of approximations, mathematical modeling and physical systems. Through a description of the analytic foundations of the theory, generalized statistical measures are defined for stochastic processes and are used to compute the statistical measures of the different classes of stochastic systems. Dissert. Abstr.

N80-16814 California Univ., Berkeley.
SPECTRAL ESTIMATION FOR A RANDOMLY SAMPLED TIME-SERIES Ph.D. Thesis
Anthony Douglas Thrall 1979 171 p
Avail: Univ. Microfilms Order No. 8000544

An entomological study of population cycles in which the data was frequently recorded on an irregular daily basis is

described. Spectral time series analysis that would have been readily available had the data been recorded each day of the experiment are provided. The problem is initially considered in a broader framework of time series problems which depart from the assumption that observations were recorded at discrete equispaced times. A model, specific to the above experimental situation, was then developed using a zero-one variable Y(t), which indicates the days on which observations were made. The variable was assumed to be a sequence of independent Bernoulli variables having periodic probabilities. The model was chosen to reflect the tendency of the researcher to observe the experiment more often during the week than on weekends.
Dissert. Abstr.

N80-16815 Indiana Univ., Bloomington.
A BAYESIAN APPROACH TO THE SELECTION OF VARIABLES IN MULTIPLE REGRESSION Ph.D. Thesis
Ramona Bowers Swaine 1979 122 p
Avail: Univ. Microfilms Order No. 8000951

A Bayesian approach to the selection of predictor variables for linear univariate multiple regression analysis is considered. Comparison of regression equations is made via the variance of the predictive distribution of the dependent variable. The predictor variables may be fixed and known, or they may be stochastic and unknown at the time the variable selection decision is made. These cases are considered separately. Prior distributions which allow for relationships among regression parameters of different equations are used. It is demonstrated that the predictive distribution variance permits exclusion of possible predictors in some cases. Empirical analysis shows the effects of changing the prior information used in making the decision and reveals that the predictive variance criterion gives results comparable to other popular variable selection criteria. Dissert. Abstr.

N80-16816 California Univ., Berkeley.
TESTS FOR NORMALITY AND SYMMETRY Ph.D. Thesis
Seongil Park 1979 54 p
Avail: Univ. Microfilms Order No. 8000473

Tests for normality, more generally symmetry, based on sample spacings are considered. Conditions are given under which the tests are unbiased and have isotopic power properties under convex orderings, when the weight function and scale estimator satisfies certain conditions. Asymptotic normality of the tests were obtained under mild conditions on the weight function and the underlying distribution function. Consistency of the tests are shown for certain alternatives. Asymptotically, optimal procedures were investigated and an efficient procedure was found. Pitman efficiencies of known tests were obtained and a new test which improves these tests was proposed.
Dissert. Abstr.

N80-16817 Princeton Univ., N. J.
ROBUST CONFIDENCE INTERVALS FOR THE ONE- AND TWO-SAMPLE PROBLEMS Ph.D. Thesis
Karen Kafadar 1979 259 p
Avail: Univ. Microfilms Order No. 7928475

A robust confidence interval for location in the one-sample problem and for the difference in locations for the two-sample problem is evaluated for its efficiency in stretched-tailed situations. The confidence interval uses an M-estimate called the biweight and its estimated variance, and the critical point from a standard Student's-t distribution. Using Monte Carlo simulation techniques, the biweight confidence intervals are shown to be highly efficient, even for extremely small error rates, on samples of sizes 5, 10, and 20. For common underlying distributions, a biweight-confidence interval using pooled scales is to be recommended, and the distribution of biweight-'t' can be approximated by a Student's-t on nine-tenths of the nominal degrees of freedom. When the underlying distributions are suspected to be different, an unpooled scale estimate should be used, and the distribution of 't' approximated by Student's-t on three-fourths of the degrees of freedom. Dissert. Abstr.

N80-16818# Florida State Univ., Tallahassee. Dept. of Statistics.
DISTRIBUTIONAL RESULTS FOR RANDOM FUNCTIONALS OF A DIRICHLET PROCESS
Robert C. Hannum, Myles Hollander, and Naftali A. Langberg Aug. 1979 13 p refs
(Contract DAAG29-79-C-0158; Grant AF-AFOSR-3678-78)
(AD-A074698; FSU-Statistics-M520; ARO-16713.1-M) Avail: NTIS HC A02/MF A01 CSCL 12/1

An expression is obtained for the distribution function of the random variable the definite integral of ZdP where P is a random distribution function chosen by Ferguson's (1973) Dirichlet process on (R, B) (R is the real line and B is the σ-field of Borel sets) with parameter alpha, and Z is a real-valued measurable function defined on (R, B) satisfying the definite integral of the absolute value of Z to the derivative of alpha - infinity. As a consequence, we show that when alpha is symmetric about 0 and Z is an odd function, then the distribution of the definite integral of ZdP is symmetric about zero. GRA

N80-16819# Massachusetts Univ., Amherst. Dept. of Mathematics and Statistics.
ON THE UNIFORMLY MINIMUM VARIANCE UNBIASED ESTIMATORS OF THE VARIANCE AND ITS RECIPROCAL OF AN INVERSE GAUSSIAN DISTRIBUTION Interim Report
Ramesh M. Korwar Jul. 1979 10 p refs
(Contract F49620-79-C-0105; AF Proj. 2304)
(AD-A074090; AFOSR-79-0979TR; TR-3) Avail: NTIS HC A02/MF A01 CSCL 12/1

The two-parameter Inverse Gaussian distribution is found to have useful applications in a wide variety of fields. The uniformly minimum variance estimator of its mean is known and is the simple mean. However, no such estimator of the variance is reported in literature. Here the uniformly minimum variance unbiased estimators of the variance and its reciprocal are derived. GRA

N80-16820# Kansas Univ., Lawrence. Dept. of Mathematics.
STOCHASTIC FILTERING AND CONTROL Interim Report, 16 May 1978 - 15 May 1979
Tyrone E. Duncan May 1979 11 p refs
(Grant AF-AFOSR-3177-77; AF Proj. 2304)
(AD-A074258; AFOSR-79-0981TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The topology of the space of minimal transfer functions has been studied with particular emphasis on symmetric transfer functions and a number of important new results have been obtained. Understanding the topology of the space of transfer functions is important in the development of identification algorithms and symmetric transfer functions arise in the description of many physical systems. The problem of state space realization of transfer functions for systems with delays has also been studied and useful results have been obtained. The problems of deterministic control, stochastic filtering and stochastic control have been studied for linear pure delay time systems. A geometric approach has been used which has simplified previous results and has obtained new results. In addition, preliminary investigations of some other related research areas has commenced.
GRA

N80-16821# Purdue Univ., Lafayette, Ind. Dept. of Statistics.
PROBABILITY AND STATISTICS AND APPLICATIONS Final Scientific Report, 1 Jun. 1977 - 31 May 1979
Leon Jay Gleser and David S. Moore Jul. 1979 10 p refs
(Grant AF-AFOSR-3291-77; AF Proj. 2304)
(AD-A074257; AFOSR-79-0961TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This final report reviews the following work: minimax estimation of the mean vectors of multivariate normal distributions and of the slopes of multivariate linear regression models when the error covariance matrix is unknown; minimax properties of generalized ridge regression estimators of regression coefficients in the classical linear model; improvements on inadmissible simultaneous estimators for the parameters of k discrete populations; Bayes multiple comparison procedures in two factor ANOVA designs; calculations of and properties of point and interval estimators of slope parameters in multivariate errors in variables regression models (linear functional equations); asymptotic pointwise optimal and asymptotically optimal sequential Bayes regional estimators for functions of a vector parameter; chi-square goodness-of-fit tests for censored data and for multivariate

normality; and the general theory and application of chi-square tests. A bibliography of publications, reports, and dissertations supported by the grant is provided. GRA

N80-16822# Oak Ridge National Lab., Tenn.
STATISTICAL ANALYSIS OF THE INTERRUPTED TIME-SERIES EXPERIMENT: SOME PROBLEMS AND A RECOMMENDED SOLUTION
T. C. Mawhinney (Indiana Univ.) and D. J. Pack (Ohio State Univ.) 1979 50 p refs Presented at the TIMS/ORSA Natl. Meeting, Milwaukee, 15 Oct. 1979
(Contract W-7405-eng-26)
(CONF-791043-1; CONF-790872-1) Avail: NTIS HC A03/MF A01

The practical implications of modeling observation dependencies using an ARIMA model with differences in before-after N's and O's as compared to the standard t-test and Behrens-Fisher test are evaluated by use of simulated data variations. Results of both the simulation study and statistical theory support the conclusion that ARIMA models should be employed to evaluate before-after (interrupted) time series data in order to avoid the potential of biased conclusions concerning true intervention effects. DOE

66 SYSTEMS ANALYSIS

Includes mathematical modeling, network analysis; and operations research.

N80-16823 Stanford Univ., Calif.
INTERACTIVE SOLUTION OF MULTICRITERION ZERO-ONE VARIABLE PROBLEMS WITH UNCERTAIN INFORMATION Ph.D. Thesis
Priyadarshi Ramprasad Shukla 1979 253 p
Avail: Univ. Microfilms Order No. 8002012

Algorithms for solving multicriterion zero-one variable problems with uncertain information are developed. Two cases of uncertainty for the trade off values are explored. The first case considers a range for the trade off value instead of a certain unique value. The second case assumes that the basic information structure is probabilistic and that the unique tradeoff value being obtained is generated from this probabilistic structure. Computational experience with the interactive algorithm obtained by solving nine different problems with two or three criteria and up to 35 zero-one variables shows that the performance of the algorithm is acceptable for practical application. The algorithm performs acceptably well even when the tradeoffs are assessed with considerable uncertainty. Dissert. Abstr.

N80-16824*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN AVERAGING BATTERY MODEL FOR A LEAD-ACID BATTERY OPERATING IN AN ELECTRIC CAR Final Report
John M. Bozek Dec. 1979 19 p refs
(Contract EC-77-A-31-1044)
(NASA-TM-79321; DOE/NASA/1044-79/5; E-277) Avail: NTIS HC A02/MF A01 CSCL 12B

A battery model is developed based on time averaging the current or power, and is shown to be an effective means of predicting the performance of a lead acid battery. The effectiveness of this battery model was tested on battery discharge profiles expected during the operation of an electric vehicle following the various SAE J227a driving schedules. The averaging model predicts the performance of a battery that is periodically charged (regenerated) if the regeneration energy is assumed to be converted to retrievable electrochemical energy on a one-to-one basis. Author

N80-16825# Illinois Univ. at Chicago Circle, Chicago. Dept. of Mathematics.
CIRCULAR BALANCED REPEATED MEASUREMENTS DESIGN Interim Report
Constantin Magda Jul. 1979 25 p refs
(Grant AF-AFOSR-3050-76; AF Proj. 2304)
(AD-A074234; AFOSR-79-0973TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The concept of a circular design is defined and when proper balance for various effects is assumed, its universal optimality is proved over the class of all designs with the same parameters. Such designs are shown to minimize the variance of the best linear unbiased estimators of contrasts of residual and direct effects over the class of equireplicated designs. All models assume first order residual effects and are of circular nature. GRA

N80-16826# National Technical Information Service, Springfield, Va.
NETWORK FLOWS, VOLUME 2. A BIBLIOGRAPHY WITH ABSTRACTS Progress Report, 1970 - Sep. 1979
Brian Carrigan Oct. 1979 76 p Supersedes NTIS/PS-78/1032; NTIS/PS-77/0891; NTIS/PS-76/0788; NTIS/PS-75/694; NTIS/PS-75/065
(NTIS/PS-79/1078/9; NTIS/PS-78/1032; NTIS/PS-77/0891; NTIS/PS-76/0788; NTIS/PS-75/684; NTIS/PS-75/065) Avail: NTIS HC $28.00/MF $28.00 CSCL 12B

The bibliography cites research reports concerning applications of network flows to problem solving. Studies on job sequencing, transportation models, water resources, communication systems, data processing, waste disposal, and circuit analysis are included. This updated bibliography contains 69 abstracts, 42 of which are new entries to the previous edition. GRA

N80-16827# National Technical Information Service, Springfield, Va.
NETWORK FLOWS, VOLUME 1. A BIBLIOGRAPHY WITH ABSTRACTS Report, 1970 - 1977
Brian Carrigan Oct. 1979 296 p
(NTIS/PS-79/1077/1) Avail: NTIS HC $28.00/MF $28.00 CSCL 12B

Research reports concerning applications of network flows to problem solving are presented. Studies on job sequencing, transportation models, water resources, communication systems, data processing, waste disposal, and circuit analysis are included. (This updated bibliography contains 289 abstracts, none of which are new entries to the previous edition.) GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N80-16828 Washington Univ., Seattle.
WEAK BASES FOR TOPOLOGICAL SPACES Ph.D. Thesis
Leslie Owen Foged 1979 78 p
Avail: Univ. Microfilms Order No. 8002448

Weak bases are studied with emphasis on sequential spaces. Several characterizations of the sequential order of a topological space are presented and the existance of countable regular spaces of arbitrary finite sequential order is proven. Countable Hausdorff spaces of arbitrary sequential order are constructed. A g-metrizable space which is is not g-developable is constructed and it is proven that a regular space is g-metrizable if and only if it is weakly first countable and admits a sigma-locally finite k-network. It is demonstrated that a g-metrizable space is stratifiable if it has finite sequential order or if it admits a sigma-locally finite covering by compact sets. Dissert. Abstr.

N80-16829# Brown Univ., Providence, R.I. Center for Dynamical Systems.
APPLICATIONS OF CENTRE MANIFOLD THEORY
Jack Carr Jun. 1979 138 p refs
(Grant DAAG29-76-G-0294)
(AD-A074052; ARO-13915-17-M) Avail: NTIS HC A07/MF A01 CSCL 12/1

The purpose of the lectures was to give an introduction to the applications of centre manifold theory to differential equations. Most of the material is presented in an informal fashion, by means of worked examples in the hope that this clarifies the use of centre manifold theory. GRA

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N80-16830# Oak Ridge National Lab., Tenn.
DRAG FORCE ON A CONDUCTIVE SPHERICAL DROP IN A NONUNIFORM MAGNETIC FIELD
J. Walker and W. M. Wells Sep. 1979 30 p ref
(Contract W-7405-eng-26)
(ORNL/TM-6976) Avail: NTIS HC A03/MF A01

The forces associated with the motion of a high velocity lithium droplet cloud traversing the magnetic field of a fusion reactor are derived. DOE

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N80-16831 British Broadcasting Corp., Kingswood (England).
SPHERICAL HARMONIC ANALYSIS AND SOME APPLICATIONS TO SURROUND SOUND
P. S. Gaskell Nov. 1979 19 p refs
(BBC-RD-1979/25) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Spherical harmonic analysis in three dimensions and azimuthal harmonic analysis in two dimensions are used in studying the problems associated with transmitting surround sound. Some of the fundamental factors and limitations of surround sound transmission are highlighted. A number of specific examples are presented. M.M.M.

N80-16832 Texas Univ. at Austin.
AN EXAMINATION OF COUPLED MODE THEORY AS APPLIED TO UNDERWATER SOUND PROPAGATION Ph.D. Thesis
Steven Ross Rutherford 1979 217 p
Avail: Univ. Microfilms Order No. 7928353

The mathematical formalism of coupled mode theory as applied to underwater sound propagation in a range dependent, ocean environment was investigated theoretically. The range dependence of an acoustic medium may be characterized by two types, range variability of the geoacoustic parameters such as sound speed and range variability of the boundary conditions. Both types of range variation are considered and coupled mode theory and its various approximations with respect to the range variability of the ocean bottom are examined. Numerical calculations for the field in a wedge-shaped waveguide are presented to illustrate the effects of the boundary condition approximation and to show how the modifications to the theory produce the desired results. The mathematical formalism is presented in a form amenable to numerical calculations. Also, numerical methods for implementing the theory are described and discussed. Dissert. Abstr.

N80-16833 Stanford Univ., Calif.
THE DESIGN OF EFFICIENT, BROADBAND ULTRASONIC TRANSDUCERS Ph.D. Thesis
John Douglas Fraser 1979 189 p
Avail: Univ. Microfilms Order No. 8001918

A new perturbation theory for wedge transducers was developed. In each case, the fundamentals of the operation of the transducers are discussed, and design techniques are given. Supporting technology was also developed, including the fabrication of composite acoustic materials, formation of acoustically thin bonds, and electrical matching transformers. Characterization techniques are given, and results are compared with theory and with the prior state of the art. Octave bandwidth bulk wave transducers operating in water with less than 4 dB total round trip insertion loss and good impulse responses were produced, as well as practical wedge transducers with conversion efficiencies as high as 44%. These transducers offer improved resolution in imaging applications and greater time-bandwidth products in signal processing applications as well as improved signal-to-noise ratio in both applications. Dissert. Abstr.

N80-16834 Stanford Univ., Calif.
A STOCHASTIC APPROACH TO ULTRASONIC TISSUE CHARACTERIZATION Ph.D. Thesis
Linda Fellingham Joynt 1979 122 p
Avail: Univ. Microfilms Order No. 8001949

Successive echo trains returned from insonified tissue were considered to be sample functions from a random process. Radio frequency echoes returned from the body during ultrasound examination by a clinical B-mode instrument were recorded in real time and subsequently analyzed off-line. Various studies of the heart were made in an attempt to develop a tissue signature characterizing diseased heart muscle as distinct from normal heart muscle. Models for normal and damaged myocardium were developed that led to a successful differentiation based on the statistics of the amplitude distributions of the returned echoes. Rician probability density functions were shown to provide a good fit to data from 'in vivo' hearts. Studies of other tissues were performed applying frequency domain. Frequency spectra were developed and used to yield information about the average spatial structure that was not discernible on the usual ultrasonic scanner display. Dissert. Abstr.

N80-16835 Engineering Sciences Data Unit, London (England).
ESTIMATION OF NOISE SHIELDING BY BARRIERS
1979 41 p
(ESDU-79011; ISBN-0-85679-255-1) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $770.50

When a barrier is placed between a sound source and an observer, sound reaches the observer by diffraction over the top of the barrier, or round the barrier edges, and by direct transmission through the barrier. In many practical cases the barrier is designed such that the transmission path is so highly attenuated that it may be neglected. Hence this item is only concerned with the sound reaching the observer via the edge of the barrier. A method is provided for estimating the shielding effect of a barrier in terms of the difference in sound level received at a given location on the side of the barrier remote from the noise source and the sound level received at the same location without the barrier. The sound attenuation due to a barrier is therefore dependent on the redistribution of sound energy by diffraction over the top, and round the edges, of the barrier and the increased propagation losses which result from the change in the length and direction of the sound propagation path due to the presence of the barrier. In the procedure used in this item for estimating the loss due to diffraction it is assumed that the noise is emitted by a point source and that both the source and observer are at large distances from the diffracting edge relative to the wavelengths of the sound considered. Also it is assumed that barriers are rigid, wedge-shaped (as described below) and have hard surfaces and sharp edges. ESDU

N80-16836 Engineering Sciences Data Unit, London (England).
EVALUATION OF THE ATTENUATION OF BROAD-BAND SOUND BY A NON-UNIFORM STILL ATMOSPHERE
1978 65 p Supersedes ESDU-78003
(ESDU-78003-A; ESDU-78003; ISBN-0-85679-228-4) For information on availability of series, sub-series, and other individual data items, write NTIS, Attn: ESDU, Springfield, Va. 22161. HC $578.50

This item provides a means of estimating the attenuation of sound across a frequency band, referred to as band attenuation, by the atmosphere in which the temperature and relative humidity vary along the propagation path. The band attenuation rate is estimated by integrating the discrete frequency attenuation over the appropriate frequency range. Values of discrete frequency attenuation are found. Allowance is made for spectrum shape, and guidance is given on the use of a layering technique for the estimation of attenuation when atmospheric properties vary with altitude. The atmospheric layering technique should be used only when the variation of the atmospheric parameters with altitude is known with sufficient confidence to enable the division of the atmosphere into layers within which temperature and relative humidity vary linearly with altitude. When considering

horizontal propagation of sound where the temperature and relative humidity vary along the propagation path, the suggested layering technique can be used by substituting linear distance for altitude. In this case any change in pressure between the layers due to variations in temperature is extremely small and should be neglected. A numerical method for the estimation of the band atmospheric attenuation rate, assuming an ideal filter shape, is given as the recommended prediction procedure. Listings of the programmed method in both BASIC and FORTRAN are provided. To enable a rapid estimate of the one-third octave band atmospheric attenuation rate to be made, an alternative graphical procedure is provided. A typical application is the correction of aircraft noise measurements to standard atmospheric conditions. ESDU

N80-16837*# California Inst. of Tech., Pasadena.
SECOND SOUND SHOCK WAVES AND CRITICAL VELOCITIES IN LIQUID HELIUM 2 Ph.D. Thesis
Timothy Neal Turner 1979 231 p refs
(Grant NsG-7508)
(NASA-CR-162687) Avail: NTIS HC A11/MF A01 CSCL 20A

Large amplitude second-sound shock waves were generated and the experimental results compared to the theory of nonlinear second-sound. The structure and thickness of second-sound shock fronts are calculated and compared to experimental data. Theoretically it is shown that at T = 1.88 K, where the nonlinear wave steepening vanishes, the thickness of a very weak shock must diverge. In a region near this temperature, a finite-amplitude shock pulse evolves into an unusual double-shock configuration consisting of a front steepened, temperature raising shock followed by a temperature lowering shock. Double-shocks are experimentally verified. It is experimentally shown that very large second-sound shock waves initiate a breakdown in the superfluidity of helium 2, which is dramatically displayed as a limit to the maximum attainable shock strength. The value of the maximum shock-induced relative velocity represents a significant lower bound to the intrinsic critical velocity of helium 2. M.G.

N80-16838*# Massachusetts Inst. of Tech., Cambridge.
STRESS WAVE ATTENUATION IN THIN STRUCTURES BY ULTRASONIC THROUGH-TRANSMISSION Final Report
Samson S. Lee and James H. Williams, Jr. Washington NASA Jan. 1980 32 p refs
(Grant NsG-3210)
(NASA-CR-3203) Avail: NTIS HC A03/MF A01 CSCL 20A

The steady state amplitude of the output of an ultrasonic through transmission measurement is analyzed and the result is given in closed form. Provided that the product of the input and output transduction ratios; the specimen-transducer reflection coefficient; the specimen-transducer phase shift parameter; and the material phase velocity are known, this analysis gives a means for determining the through-thickness attenuation of an individual thin sample. Multiple stress wave reflections are taken into account and so signal echoes do not represent a difficulty. An example is presented for a graphite fiber epoxy composite (Hercules AS/3501-6). A direct method for continuous or intermittent monitoring of through thickness attenuation of plate structures which may be subject to service structural degradation is provided. M.M.M.

N80-16839*# Systems Research Labs., Inc., Newport News, Va. RADA Div.
EXPERIMENTAL EVALUATION OF ACTIVE AND PASSIVE MEANS OF ALLEVIATING ROTOR IMPULSIVE NOISE IN DESCENT FLIGHT
D. S. Janakiram Nov. 1979 86 p refs
(Contract NAS1-15337)
(NASA-CR-159188; RASA/SRL-14-79-04) Avail: NTIS HC A05/MF A01 CSCL 20A

A controlled wind tunnel test program was conducted on a model 2.14 m (7 ft) diameter teetering rotor to determine the effectiveness of blade tips such as the Ogee tip and the TAMI (Tip Air Mass Injection) tip in reducing the impulsive noise due to blade-vortex interaction in descent flight. In addition, a full rectangular tip which has the same span as the Ogee tip and an effective rectangular tip which has the same lifting area as the Ogee tip were also considered. The tests were conducted at two advance ratios (0.125 and 0.14) with various descent rates ranging from steady level flight to about 6 m/sec (20 ft/sec). A comparison of the performance of different rotors showed that for the same tip Mach number and thrust, the Ogee tip rotor absorbed more power than the full rectangular tip rotor, while the TAMI tip rotor absorbed more power than the effective tip rotor. M.M.M.

N80-16840# Mississippi Univ., University. Physical Acoustics Research Group.
PROPAGATION OF SOUND THROUGH THE ATMOSPHERE: EFFECTS OF GROUND COVER 2 Final Report, 1976 - 1979
H. E. Bass and L. N. Bolen 30 Jun. 1979 55 p refs
(Grant DAAG29-76-G-0258)
(AD-A073262; PARGUM-79-01; ARO-14002.2-EX) Avail: NTIS HC A04/MF A01 CSCL 20/1

Measurements of sound amplitude in the vicinity of a ground plane have been made as a function of frequency of the sound source (50 Hz - 2000 Hz), distance of propagation (5m - 300m), and surface conditions. By treating the impedance as an adjustable parameter, the surface impedance as a function of frequency was determined from the measured amplitudes using a theoretical treatment of a spherical wave in the vicinity of a locally reacting surface. The impedance measurements covered the frequency range 50 Hz to 1000 Hz. In this frequency range, the results for three distinctly different surfaces suggest that the impedance can be computed from the specific flow resistance and that grass has little effect on the surface impedance except for decreasing the flow resistance due to the root structure. Experimental studies of surface impedance should include measurements of soil parameters such as density, specific flow resistance, and moisture content so that comparisons can be made between the results from different laboratories and so that a data base for additional theoretical development can be established. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N80-16841 Utah Univ., Salt Lake City.
THEORETICAL STUDIES OF EXCESS ELECTRON MOBILITIES AND CHANGE-TRANSFER SPECTRA Ph.D. Thesis
Jeanne Louise McHale 1979 112 p
Avail: Univ. Microfilms Order No. 8000968

A theoretical formalism describing the dynamics of an excess electron in equilibrium with a molecular fluid is developed. The Hamiltonian for the solvent molecules plus the extra electron was partitioned to allow the effects of the external medium to be treated in an average manner. The mean square distance traveled by the electron as a function of time was found by averaging the second moment of the electron density over the solvent molecules' positions and momenta. The influence of solvent structure and solvent dynamics on the migration of the electron is discussed. The model was applied to a one dimensional system with nearest neighbor interaction. The equations are discussed in terms of the influence of solvent molecules' fluctuations on the type of motion observed. Applications to two component systems are also treated. Dissert. Abstr.

N80-16842 Pennsylvania Univ., Philadelphia.
LOW ENERGY ELECTRON VIBRATIONAL EXCITATION OF MOLECULES ADSORBED ON SURFACES: EXPERIMENT AND THEORY Ph.D. Thesis
Wilson Ho 1979 292 p
Avail: Univ. Microfilms Order No. 7928141

A specified amount of the desired molecules are let into the vacuum system and allowed to adsorb on the surface. A beam of low energy electrons is incident on the surface and the scattered electrons are energy analyzed. Some of the electrons scatter inelastically, typically 1 part in a thousand, due to vibrational excitation of the adsorbed molecules. The character-

istic discrete energy losses reflect the particular chemical bonds of the adsorbed species on the surface. As in conventional infrared absorption and Raman scattering spectroscopies, chemical identification and molecular structural determination are possible by analyzing the vibrational frequencies and intensities. The sensitivity for detecting the adsorbed species is approximately 0.01 of the fractional coverage of the surface. Dissert. Abstr.

N80-16843 California Univ., Berkeley.
SELECTED TOPICS ON THE ELECTRONIC STRUCTURE OF SMALL MOLECULES Ph.D. Thesis
William Clarence Swope 1979 75 p
Avail: Univ. Microfilms Order No. 8000533

A systematic procedure is presented for constructing symmetrized functions of the coordinates of N fermion particles which may be used as trial wavefunctions in a quantum mechanical description of an N electron molecular system. The functions are symmetrized with respect to the mathematical point of operators which commute with the system's electronic Born-Oppenheimer Hamiltonian, as well as the permutation group. The coupling procedure is applied to the study of the electronic structure of several states of the diatomic molecule sulfur oxide. A model is presented which provides insight into some of the electric anp magnetic properties of small molecules.
Dissert. Abstr.

N80-16844 Stanford Univ., Calif.
STUDIES OF ATOMS AND MOLECULES USING MULTIPHOTON ABSORPTION OF ULTRAVIOLET LASER RADIATION Ph.D. Thesis
Daniel Jacob Kigler 1979 160 p
Avail: Univ. Microfilms Order No. 8001954

Properties of excited atoms and molecules are studied using multiphoton absorption rare-gas-halide laser radiation. The basic technique involves observation of fluorescent emission from gas samples irradiated by an ArF (193 nm) or KrF (248 nm) laser. Following a review of the properties of RGH lasers and their application to nonlinear excitation, three sets of experiments are described. First, collisional and photoabsorption properties of electronically excited H2 are studied by means of selective excitation of the H2 E, F 1 Sigma g + double minimum state. Two-photon excitation of Xe (5p5 6p) at 248 nm and of Xe(+) and Kr (4p5 6p) at 193 nm forms the basis for another group of experiments. Finally, studies of photolytic production of S(1S) atoms by two-photon dissociation of OCS at 193 nm are reported. Dissert. Abstr.

N80-16845 California Univ., Berkeley.
PHOTODISSOCIATION PROCESSES IN MOLECULAR BEAMS Ph.D. Thesis
Lee Richard Carlson 1979 144 p
Avail: Univ. Microfilms Order No. 8000298

The photodissociation dynamics of molecules in a molecular beam was studied. Photofragmentation translational spectroscopy was utilized to observe the photodissociation dynamics of ozone. Using a supersonic molecular beam and a 10 nanosecond pulsed laser, the velocities of the fragment products were measured by the method of time of flight. Dissert. Abstr.

N80-16846 Rutgers - The State Univ., New Brunswick, N. J.
THE TEMPERATURE AND DENSITY DEPENDENCE OF THE NUCLEAR SPIN-SPIN INTERACTION IN HD GAS AND FLUID Ph.D. Thesis
James Richard Beckett 1979 286 p
Avail: Univ. Microfilms Order No. 7928383

Precise measurements were made of the temperature and density dependence of the indirect electron coupled nuclear spin spin interaction (J sub HD) in HD gas and liquid. These precise measurements were possible because of the double resonance spin echo technique. The use of this spin echo technique in principle allowed the frequency resolution of the measurements to be determined by the transverse decay time T sub 2, rather than by the magnetic field inhomogeneity determined decay time T sub 2. Measurements of J sub HD in liquid HD were made to precision of + or - .002 Hz. Dissert. Abstr.

N80-16847 Stanford Univ., Calif.
THE PRODUCTION OF NEUTRINOS AND NEUTRINO-LIKE PARTICLES IN PROTON-NUCLEUS INTERACTIONS Ph.D. Thesis
John Patrick Dishaw 1979 162 p
Avail: Univ. Microfilms Order No. 8001904

An experimental search was performed to look for the direct production of neutrinos or neutrino like particles. Possible sources of such particles include the semileptonic decay of new heavy particles such as charm, and the direct production of a light neutral Higgs particle such as the axion. The production of these particles was inferred by energy nonconservation in the collision of a proton with an iron nucleus. The total visible energy of the interaction was measured using a sampling ionization calorimeter. The calorimeter was calibrated with muons. Energy nonconservation in the data is manifest as a nonGaussian distribution on the low side of the calorimeter measured energy. Model calculations yielded the fraction of events expected in the nonGaussian behavior for the various sources of neutrinos or neutrino like particles. Dissert. Abstr.

N80-16848 Stanford Univ., Calif.
HIGH RESOLUTION SPECTROSCOPY OF THE HYDROGEN BALMER-ALPHA LINE Ph.D. Thesis
John Elmore Mitchal Goldsmith 1979 105 p
Avail: Univ. Microfilms Order No. 8001926

The wavelength of the hydrogen 2S sub 1/2 - 3P sub 1/2 transition, observed by using polarization spectroscopy to probe metastable hydrogen atoms produced in a dc discharge, was measured relative to a nearby molecular iodine transition. A measurement of the wavelength of the iodine transition then yielded the value R sub infinite = 109737.31476(32) cm for the Rydberg constant, with a precision more than three times greater than obtained previously. An improved measurement of the iodine wavelength could immediately yield an additional nearly three-fold improvement in the Rydberg constant, without requiring any further study of hydrogen transitions. Dissert. Abstr.

N80-16849 State Univ. of New York at Binghamton.
ON THE MANY-BODY THEORY FOR SYSTEMS CONSISTING OF COMPOSITE PARTICLES Ph.D. Thesis
Sadhu Mahendra Singh 1979 137 p
Avail: Univ. Microfilms Order No. 7923430

The many body theory for a system composed of two species, each consisting of spin 1/2 elementary constituents, was formulated in terms of four constituent composites from the first principle. The identical constituent pair language and nonidentical constituent pair language are derived from the four constituent composite language. Using a simple separable potential, for Bose like condensation of the fermion pairs into the lowest energy state, the critical density for the pair condensation in the lowest energy state as a function of the interaction strength, the momentum distribution function in the condensed mode, the pair binding energy in the low density limit as a function of the interaction strength and the ground state energy per pair as a function of the density are computed within the composite Hartree-Fock approximation. Dissert. Abstr.

N80-16850 Washington Univ., St. Louis, Mo.
THE SIMPLE ATOMIC HOPPING PROBLEM. PARTICLE CORRELATION FUNCTIONS WITH APPLICATION TO DIPOLAR INDUCED SPIN LATTICE RELAXATION Ph.D. Thesis
Otto Francis Sankey 1979 160 p
Avail: Univ. Microfilms Order No. 8002462

A model of atomic hopping is developed which takes into account the correlated motion of distinguishable particles in a lattice. These correlations are included by prohibiting multiple occupancy of a lattice site or particles to pass through each other. The method is used to derive expressions for the correlation functions which describe the motion of a single specific particle or a pair of distinguishable particles. These correlation functions are indirectly measured in NMR relaxation time studies where the relaxation is caused by magnetic dipolar interactions. Particular attention is given to spin lattice relaxation time of hydrogen in disordered phases of various metal hydrides. Dissert. Abstr.

N80-16851*# Hawaii Univ., Honolulu. Inst. for Astronomy.
NON-MAXWELLIAN VELOCITY DISTRIBUTION FUNCTIONS ASSOCIATED WITH STEEP TEMPERATURE

GRADIENTS IN THE SOLAR TRANSITION REGION. PAPER 1: ESTIMATE OF THE ELECTRON VELOCITY DISTRIBUTION FUNCTIONS
Robert Roussel-Dupre [1979] 49 p refs
(Contract NAS5-22409; Grants NsG-7536; NSF ATM-78-22202; NSF GA-31477)
(NASA-CR-162696) Avail: NTIS HC A03/MF A01 CSCL 20H

It was shown that, in the presence of the steep temperature gradients characteristic of EUV models of the solar transition region, the electron and proton velocity distribution functions are non-Maxwellian and are characterized by high energy tails. The magnitude of these tails are estimated for a model of the transition region and the heat flux is calculated at a maximum of 30 percent greater than predicted by collision-dominated theory. M.M.M.

N80-16852*# Hawaii Univ., Honolulu. Inst. of Astronomy.
NON-MAXWELLIAN VELOCITY DISTRIBUTION FUNCTIONS ASSOCIATED WITH STEEP TEMPERATURE GRADIENTS IN THE SOLAR TRANSITION REGION. PAPER 2: THE EFFECT OF NON-MAXWELLIAN ELECTRON DISTRIBUTION FUNCTIONS ON IONIZATION EQUILIBRIUM CALCULATIONS FOR CARBON, NITROGEN AND OXYGEN
Robert Roussel-Dupre [1979] 21 p refs
(Contract NAS5-22409; Grants NsG-7536; NSF ATM-78-22202; NSF GA-31477)
(NASA-CR-162695) Avail: NTIS HC A02/MF A01 CSCL 20H

Non-Maxwellian electron velocity distribution functions, previously computed for Dupree's model of the solar transition region are used to calculate ionization rates for ions of carbon, nitrogen, and oxygen. Ionization equilibrium populations for these ions are then computed and compared with similar calculations assuming Maxwellian distribution functions for the electrons. The results show that the ion populations change (compared to the values computed with a Maxwellian) in some cases by several orders of magnitude depending on the ion and its temperature of formation. A.R.H.

N80-16853# Houston Univ., Tex. Dept. of Chemistry.
INTERACTIONS OF MOLECULAR AND ION BEAMS WITH SURFACES Final Report, 1 Jan. 1977 - 31 May 1979
J. Wayne Rabalais 21 Jun. 1979 27 p refs
(Grant DAAG29-77-G-0054)
(AD-A073278; ARO-14361.24-C; FR-1) Avail: NTIS HC A03/MF A01 CSCL 20/8

Low kinetic energy active ion bombardment of transition metals, Si, Ge, Sn, Pb, graphite, and diamond have shown that chemical reactions can be induced between ion beams and surfaces. These reactions are specific and selective with respect to the ion-target combination and the thickness of the reacted layer can be controlled by varying the ion energy. The techniques of X-ray and UV photoelectron spectroscopy, auger spectroscopy, secondary ion mass spectrometry (SIMS) and thermal desorption spectrometry (TDS) under ultra-high vacuum conditions are used to characterize the products of the beam-surface reactions. The reaction of 30-3000 eV nitrogen beams with the first-row transition metals results in the formation of metal nitrides. The amount of nitrogen reacting with the metal can be correlated to the enthalpy of formation of the metal nitride. Reactions of nitrogen with M, MO, and MO2 (M = Si, Ge, Sn, Pb) produces nitrides with no evidence for nitrate, nitrite, or nitroso formation in the oxides. A mechanism is proposed for the reaction which involves charge exchange neutralization and dissociation of the ion at the surface followed by penetration into the lattice, thermalization, and finally chemical reaction. GRA

N80-16854# Oak Ridge National Lab., Tenn.
CENTRAL COLLISIONS IN INTERMEDIATE ENERGY HEAVY-ION REACTION
C. Y. Wong 1979 36 p refs Presented at the Symp. on Heavy Ion Phys. from 10-200 MeV/A, Upton, N.Y., 16 Jul. 1979
(Contract W-7405-eng-26)
(CONF-790743-5) Avail: NTIS HC A03/MF A01

To understand the underlying physics, the effect of the mean field and the effect of particle collisions are studied separately. It is found that the sudden increase in the density of the overlapping region can cause the volcano effect, leading to the complete disintegration of one of the nuclei. The self-consistent mean field also gives rise to the bunching instability when the two Fermi spheres of the colliding nucleons separate. The collision between nucleons, on the other hand, leads to irreversible dissipation, thermalization, and the possibility of a hydrodynamical description of the dynamics. The dynamics of central collisions were studied using the hydrodynamical description for many combinations of targets and projectiles at different energies. The formation of shock waves, sidesplash, and the complete disintegration of the whole nucleus are examined. Nuclear viscosity is found to affect the angular distribution of the reaction products and also the maximum compression ratio achieved during the collision. DOE

N80-16855# Brookhaven National Lab., Upton, N. Y.
NEW DIRECTIONS IN ELEMENTARY PARTICLE PHYSICS: P ANTI P FROM VERY LOW TO VERY HIGH ENERGIES
M. Jacob (CERN, Geneva) 1979 60 p refs Presented at LAMPF Workshop, Los Alamos, N. Mex., 20-31 Aug. 1979
(Contract EY-76-C-02-0016)
(BNL-26515) Avail: NTIS HC A04/MF A01

Low energy anti pp physics are reviewed including annihilation processes, the spectroscopy of baryonium states, quasinuclear states and their relation to baryonium, the spectroscopy of protonium, and access to the whole charmonium family. High energy anti pp physics is reviewed covering total cross section rise, the common shape of cross sections, real part of forward amplitude, particle production, quantum number excitation, high transverse momentum, and high mass lepton pair. The search for the weak bosons, hadron physics at collider energies, and the anti pp collider program are discussed. DOE

N80-16856# Brandeis Univ., Waltham, Mass. Dept. of Physics.
RESEARCH IN ELEMENTARY PARTICLE PHYSICS Technical Progress Report, 1 May 1978 - 29 May 1979
L. E. Kirsch and H. J. Schnitzer 1979 15 p refs
(Contract EY-76-S-02-3230)
(COO-3230-2) Avail: NTIS HC A02/MF A01

The research performed on both the theoretical and experimental properties of elementary particles is described. Experiments with the multiparticle spectrometer for kaon production, muon production, and baryonium/hadronic charm search are discussed. A.W.H.

N80-16857# City Univ. of New York, N. Y. Dept. of Chemistry.
APPROXIMATION METHODS FOR THE PARTITION FUNCTIONS OF ANHARMONIC SYSTEMS Ph.D. Thesis
P. Lew Jul. 1979 132 p refs
(Contract EY-76-S-02-3127)
(COO-3127-30-T1) Avail: NTIS HC A07/MF A01

The analytical approximations for the classical, quantum mechanical, and reduced partition functions of the diatomic molecule oscillating internally under the influence of the Morse potential were derived and their convergences were tested numerically. The analytical method is described for use in the treatment of anharmonic systems. DOE

N80-16858# Massachusetts Inst. of Tech., Cambridge. Dept. of Chemistry.
DOUBLE RESONANCE SPECTROSCOPY OF MULTIPLE-PHOTON EXCITED MOLECULES
J. I. Steinfeld, C. C. Jensen (Joint Inst. for Lab. Astrophysics), T. G. Anderson, and C. Reiser 1979 10 p refs Presented at the 4th Intern. Congr. Laser 79 Opto-Electron., Munich, 2 Jul. 1979
(Contract EY-76-S-02-2793)
(COO-2793-15; CONF-790720-3) Avail: NTIS HC A02/MF A01

A diode infrared laser double resonance investigation was conducted of the initial photon absorption step in SF6. A variety of double resonance effects were observed: two level, three level, and four level. The utilization of the diode infrared laser double resonance to study multiple photon excitation in polyatomic

molecules and vibrational levels above the first excited state onto the quasi continuum is discussed. DOE

N80-16859# Oak Ridge National Lab., Tenn.
RADIATION FROM Ag AND K FILM BOMBARDED BY LOW ENERGY ELECTRONS Ph.D. Thesis
M. S. Chung, T. A. Callcott, and E. T. Arakawa Nov. 1978 95 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6527) Avail: NTIS HC A05/MF A01

Photon spectra from metallic films irradiated by low energy electrons (10-1500 eV) were investigated. Both radiative and nonradiative plasmon modes were studied. For silver films, two peaks were resolved when the films were very smooth. The intensity of the surface plasmon radiation was measured as a function of the incident electron energy for energies between 100 eV and 1200 eV and found to have a linear dependence. DOE

N80-16860# Oak Ridge National Lab., Tenn.
COHERENCE EFFECTS IN HEAVY ION-ATOM COLLISIONS
C. Bottcher 1978 16 p refs Presented at Workshop on Coherence and Correlation in Atomic Collisions, London, 18 Sep. 1978
(Contract W-7405-eng-26)
(CONF-780938-1) Avail: NTIS HC A02/MF A01

An approach to charge capture and ionization by highly stripped projectiles is described and shown to explain cross section systematics through the periodic table. Oscillations in cross section with respect to charge state observed around atomic number 70 are explained as an f-wave resonance in the target electron-projectile scattering. The ratio of H2 to H cross sections for both light and heavy projectiles is shown to fit a two center coherent scattering model; independent scattering by the two centers is not a good assumption for velocities below 4 A.U. Similar coherence effects are predicted in stripping by molecular gases even in multielectron processes wodre the independent atom model might be thought valid. Recent experiments on the forward peak of electrons ejected from the projectile show interesting structure which can be partly explained without invoking interference effects. DOE

N80-16861# Brown Univ., Providence, R. I.
INTERACTIONS OF MOLECULES WITH SURFACES Progress Report, 1 Aug. 1978 - 30 Apr. 1979
E. F. Greene Apr. 1979 13 p refs
(Contract ER-78-S-02-4974)
(COO-4974-1) Avail: NTIS HC A02/MF A01

The elastic scattering of a velocity selected beam of Kr atoms from the surface of a graphite crystal is examined. The angular distribution and energy dependence of the scattering was compared with the predictions of a model. The yields of positive ions produced when beams of neutral alkali atoms hit hot surfaces of silicon or alumina were measured for various temperatures of the surfaces. A quasi equilibrium model for the ionization was developed. DOE

N80-16862# Rensselaer Polytechnic Inst., Troy, N. Y.
THEORY OF HEAVY ION COLLISIONS Annual Progress Report
D. Sperber Aug. 1978 14 p refs
(Contract EY-76-S-02-3463)
(COO-3463-51) Avail: NTIS HC A02/MF A01

Theoretical studies of heavy ion collisions for the period 1977 to 1978 are described. Complete damping, dynamical and random aspects, the role of deformation and transfer and nonequilibrium aspects in strong damping, a thermodynamic model of strongly damped collisions with one body dissipation, fusion excitation functions, and a hydrodynamical model for the disintegration of a hot zone in heavy ion collisions are considered. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N80-16863 California Univ., Berkeley.
INDEPENDENT PARTICLE ASPECTS OF NUCLEAR DYNAMICS Ph.D. Thesis
Michael Cornelius Robel 1979 283 p
Avail: Univ. Microfilms Order No. 8000492

A generalization of the independent particle model from nuclear statics to nuclear dynamics is discussed. Attention is centered on the average behavior of nuclear dynamics, as opposed to detailed behavior, such as the characteristic of shell effects in nuclear statics. A one body model is applied to nuclear vibrations. The wall formula which supplies the dissipation is appended to the standard, hydrodynamical theory of vibrations. The combination of internal, Fermi motion, and relative nuclear motion with refraction at the host's surface is calculated to produce well focused emission patterns in velocity space, which are called Fermi jets. Dissert. Abstr.

N80-16864 Notre Dame Univ., Ind.
RESONANCES IN NUCLEAR PHYSICS Ph.D. Thesis
Mosleh-Uddin Ahmed 1980 92 p
Avail: Univ. Microfilms Order No. 8002604

Resonance phenomena in nuclear physics are examined in the light of the analytic properties of the S matrix. A resonant state is considered to correspond to a suitably located pole in the S matrix or the scattering amplitude. A procedure is described for extracting the pole position of a resonant amplitude from a knowledge of the phase shift versus energy. Effective range expansion of the scattering amplitude is invoked to obtain the energy dependence. Pole positions are determined for the four p-wave resonances in the nucleon-alpha system with high precision. The use of pole position to define the mass of unstable nuclear states is discussed and the model independence of the pole position is emphasized. Dissert. Abstr.

N80-16865# Columbia Univ., New York. Dept. of Physics.
THEORETICAL HIGH ENERGY PHYSICS Progress Report, 1 May 1978 - 30 Apr. 1979
T. D. Lee Jun. 1979 22 p
(Contract EY-76-C-02-2271)
(COO-2271-102) Avail: NTIS HC A02/MF A01

The research in high energy physics is summarized. Publications are listed. DOE

N80-16866# California Univ., Livermore. Lawrence Livermore Lab.
FUSION: THE POWER SOURCES OF THE FUTURE INERTIAL CONFINEMENT OPTION
V. Rupert 13 Jun. 1979 19 p Presented at the Soc. of Women Engr. Natl. Student Conf., San Francisco, 27 Jun. 1979
(Contract W-7405-eng-48)
(UCRL-82768; CONF-790698) Avail: NTIS HC A02/MF A01

The advantageous features and the methods being pursued toward achieving power generation from inertial confinement fusion are discussed. The concept of nuclear fusion is reviewed which includes a discussion of fusion reactions using deuterium and tritium. Research progress in inertial confinement fusion is reported and the application of lasers, electron beams, and ion beams to drive the compression and heating of the fusion fuels is surveyed. A.W.H.

N80-16867# Oak Ridge National Lab., Tenn. Fusion Energy Div.
PULSE PILEUP EFFECTS OF PLASMA ELECTRON TEMPERATURE MEASUREMENTS BY SOFT X-RAY ENERGY ANALYSIS
G. R. Dyer, G. H. Neilson, and G. G. Kelley Oct. 1978 26 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6541) Avail: NTIS HC A03/MF A01

The electron temperature of hot plasmas was derived from

bremsstrahlung spectra obtained by pulse height analysis using a lithium compensated silicon detector. Time resolved temperature measurements required high counting rates, with ultimate rate limited by pulse pileup. To evaluate this limit, spectral distortion due to pileup and consequent effects on temperature determination were investigated. Expressions for distorted spectra were derived as functions of Maxwellian temperature and pileup fraction for both square and triangular pulse shapes. A comparison of temperatures obtained from distorted spectra with actual values indicates that measurements with less than 10 percent error can be made in the absence of line radiation, even from spectra containing 40 percent pileup. DOE

N80-16868# Oak Ridge National Lab., Tenn. Computer Sciences Div.
QUARTZ: A NUMERICAL SIMULATION OF AN ASYMMETRIC ELECTROSTATIC ACCELERATOR
J. H. Wooten, L. J. Brooks, D. H. McCollough, R. W. McGaffey, and J. H. Wheaton 1979 25 p refs Presented at the 3rd IMACS Intern. Symp. on Computer Methods for Partial Differential Equation, Bethlehem, Pa., 20 Jun. 1979
(Contract W-7405-eng-26)
(CONF-790619-2) Avail: NTIS HC A02/MF A01

The physics and numerical aspects of the development of the computer code QUARTZ are given. This code includes the (1) use of a finite element code to obtain solutions of Poisson's equation in an asymmetric, three dimensional volume; (2) inclusion of space charge neutralization by electrons; and (3) inclusion of ion space charge through an iterative procedure. DOE

N80-16869# Brown Univ., Providence, R. I. Dept. of Physics.
RESEARCH PROGRAM IN THEORETICAL HIGH-ENERGY PHYSICS Progress Report
D. Feldman 1 Oct. 1978 12 p refs
(Contract EY-76-C-02-3130)
(COO-3130TA; Brown-HET-377) Avail: NTIS HC A02/MF A01

The theoretical physics studies of high energy phenomena, the properties and interactions of elementary particles, and quantum field theory are reported. The applications of field theoretic methods to the general theory of relativity, gravitation, cosmology, and bound state mean field theory are considered. A.W.H.

N80-16870# Notre Dame Univ., Ind.
MULTIQUARK MESONS REVISITED
S. K. Bose and E. C. G. Sudarsham Aug. 1978 20 p refs
(Contract EY-76-S-05-3992)
(ORO-3992-344) Avail: NTIS HC A02/MF A01

A model of meson states which speculated on the existance of mesons that might constitute multiplets larger than the familiar nonets, denoted multiquarks, is reviewed. The structure of the meson tensor is presented and results in meson-baryon coupling are discussed. A.W.H.

N80-16871# Office of Radiation Programs, Washington, D. C. Technology Assessment Div.
SEDIMENT CHARACTERISTICS OF THE 2800 METER ATLANTIC NUCLEAR WASTE DISPOSAL SITE: RADIONUCLIDE RETENTION POTENTIAL
James Nelheisel Sep. 1979 38 p refs Prepared in cooperation with Corps of Engineers, Washington, D.C.
(PB-301255/6; ORD/TAD-79/10) Avail: NTIS HC A03/MF A01 CSCL 18G

The sediments of the abandoned 2800 meter Atlantic nuclear waste dumpsite were analyzed for texture mineral composition, physical properties, cation exchange capacity, and factors effecting sediment deposition. Ocean disposal was evaluated as an alternative nuclear waste disposal method. The sediments physical and chemical properties were evaluated in the light of the geologic setting for their potential role in retarding radionuclide leachate migration from the waste drums to the water column. GRA

N80-16872# Nuclear Utility Services, Inc., Palo Alto, Calif.
LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT. VOLUME 5: POLICY RECOMMENDATIONS, CONCLUSIONS AND SUMMARY Final Report
Fred Feizollahi, R. Jon Stoovky, John M. Connelly, and Thomas L. Jentz Aug. 1979 82 p refs
(PB80-105083; NUS-3383; CAEC-44) Avail: NTIS HC A05/MF A01; Also available in set of 5 reports PB80-105034, HC E13 CSCL 18G

Low-level waste management technology for light water reactors is evaluated. The problems that must be solved to allow the development of large-scale management of low-level radioactive wastes generated at nuclear power facilities and by the nuclear power industry in California are identified. A technical, economic, and environmental overview of waste management alternatives is presented. GRA

N80-16873# Nuclear Utility Services, Inc., Palo Alto, Calif.
LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT. VOLUME 2: FORECAST OF LOW-LEVEL RADWASTE MANAGEMENT REQUIREMENTS Final Report
Fred Feizollahi Nov. 1978 62 p refs Sponsored by California Energy Resources Conservation and Development Commission
(PB80-105059; NUS-3158-Vol-2; CAEC-010-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 18G

Low level waste management technology for light water reactors are evaluated and the problems that must be solved within the next few years to allow for the orderly development of large scale management of low level radioactive wastes generated at nuclear power facilities and by the nuclear power industry in California are identified. The future requirements for power reactor low level waste management are discussed and quantities of low level radioactive wastes that will be generated in commerical light water-reactor plants are forecasted. GRA

N80-16874# Nuclear Utility Services, Inc., Palo Alto, Calif.
LOW-LEVEL RADIOACTIVE WASTE MANAGEMENT. VOLUME 3: FEASIBILITY OF VOLUME-REDUCTION PROCESSES Final Report
Fred Feizollahi, J. Wynn Phillips, and William H. Bell Nov. 1978 100 p refs Sponsored by California Energy Resources Conservation and Development Commission
(PB80-105067; NUS-3183-Vol-3; CAEC-42-Vol-3) Avail: NTIS HC A05/MF A01 CSCL 18G

Low level waste management technology for light reactors is investigated. Volume reduction technology is highlighted and evaluated for application to low level radioactive waste from light reactor plants. A number of volume reduction systems are examined including fluidized bed dryers, bitumen systems, dry waste compactors, and evaporative crystallization. A.W.H.

74 OPTICS

Includes light phenomena.

N80-16875 Stanford Univ., Calif.
TIME INTEGRATING OPTICAL SIGNAL PROCESSING Ph.D. Thesis
Peter Kellman 1979 149 p
Avail: Univ. Microfilms Order No. 8001952

Optical techniques for linear signal processing applied to large time bandwidth product operations are examined. A comprehensive treatment of time integrating acousto-optic signal processing is given. The extension of one dimensional time integrating optical correlation to two dimensional processing, the concept of interferometric detection with electronic reference, and the generalization of these signal processing techniques to complex computation are discussed. One and two dimensional complex signal processing algorithms are developed for noncoherent optical realizations and the class of achievable signal processing operations is derived. Analysis of time integrating algorithms for complex spectral analysis and ambiguity function processing is presented. Correlation and power spectral estimates are defined and signal to noise ratios are derived. Dissert. Abstr.

N80-16876# Bendix Corp., Kansas City, Mo.
X-RAY POLE FIGURE ANALYSIS Final Report
D. M. Jarboe and D. E. Lacey Sep. 1978 54 p refs
(Contract EY-76-C-04-0613)

(BDX-613-1829-Rev) Avail: NTIS HC A04/MF A01

The data used to produce pole figures are obtained by X-ray diffraction techniques. The techniques are complicated and can be simplified using computerized data acquistion, reduction, and CRT display techniques. Pole figures of cold-rolled cartridge brass (70Cu-30Zn) taken from published literature were found to closely compare with results achieved at Bendix Kansas City. DOE

N80-16877# National Bureau of Standards, Boulder, Colo. National Engineering Lab.
DESIGN OF A REFLECTION ON APPARATUS FOR LASER BEAM PROFILE MEASUREMENTS
Eric G. Johnson, Jr. Jul. 1979 128 p refs Sponsored in part by DOD, Calibration Coordination Group
(Contract CCG-78-109)
(PB80-101256; NBS-TN-1015) Avail: NTIS HC A07/MF A01 CSCL 20F

Topics covered include: (1) the use of Fourier optics concepts with off-axis reflections and rough surfaces to provide the basis for accurate computer simulation of laser beams; (2) the program, BEAM, which generates the expected behavior of the apparatus under variation of laser wavelength, physical dimensions for curvatures, hologram structure, and changes in positions of the various components; (3) the simulation results which demonstrate the expected characteristics for the apparatus; and (4) the key element in the apparatus, namely the reflection hologram, which requires discussion of the design, construction, and testing of this element. The Hartman plate method is described briefly so that a comparison between it and the holographic method can be made. The comparison shows why the holographic method is best for a standard for irradiance and phase-front measurements. GRA

N80-17016# Joint Publications Research Service, Arlington, Va.
CARL ZEISS JENA PRODUCTION OF OPTICAL PRECISION INSTRUMENTS DESCRIBED
K. Muetze *In its* E. Europe Rept.: Sci. Affairs, No. 659 (JPRS-74911) 11 Jan. 1980 p 23-54 Transl. into ENGLISH from Feingeraetetechnik (E. Berlin), v. 28, no. 10, 1979 p 437-445 (For primary document see N80-17015 07-99)
Avail: NTIS HC A07/MF A01

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N80-16878 Princeton Univ., N. J.
TWO-DIMENSIONAL EIGENMODE ANALYSIS OF THE TRAPPED-ION INSTABILITY Ph.D. Thesis
Richard Marchand 1979 197 p
Avail: Univ. Microfilms Order No. 7928481

A fully two dimensional eigenmode analysis of trapped ion instability in an axisymmetric toroidal geometry is discussed. The calculation takes into account the basic dynamics associated with other low frequency modes such as the trapped electron instability and the ion-temperature-gradient instability. The formalism is also applicable to the familiar radially local and one dimensional radiation radial approximations. Results obtained in these limits are represented. The radially local limit is also used to investigate the possible presence of low frequency microinstabilities in the recent neutral-beam heated PLT discharges. In this case, the ion temperature gradients are found to have a strong destabilizing influence, and an ion temperature threshold is computed. For higher shear plasmas, the radial structure of the trapped-ion mode is found to differ considerably from the one-dimensinal approximation. Dissert. Abstr.

N80-16879 California Univ., Berkeley.
THE ANNIHILATION MODEL OF THE TORMAC SHEATH Ph.D. Thesis
James Henry Hammer 1979 144 p
Avail: Univ. Microfilms Order No. 8000366

A one dimensional, steady state fluid model is developed to describe the boundary layer between plasma and magnetic field that occurs in the Tormac sheath. The model includes transport across the magnetic field as well as mirror losses along the field, the latter being represented as annihilation terms in the one dimensional equations. The model equations are derived from the two dimensional, time dependent hierarchy of equations generated by taking velocity moments of the kinetic equation including collisions. With the approximations a set of nonlinear ordinary differential equations is generated with independent variable x, the distance across the sheath. The annihilation equations are integrated numerically for a variety of situations: poloidal field reversed and nonreversed sheaths; classical and anomalous collisionality; including or excluding electron wall interactions. The integration yields profiles for density, pressure, flow velocity, magnetic and electric fields as well as the eating in rate of the sheath and the floating electrostatic potential. Dissert. Abstr.

N80-16880# Nagoya Univ. (Japan). Inst. of Plasma Physics.
STABILITY OF A TOROIDAL PLASMA BY HOT ELECTRON ANNULUS IN A BUMPY TORUS
H. Sanuki and M. Fujiwara Dec. 1979 18 p refs
(IPPJ-426) Avail: NTIS HC A02/MF A01

The ballooning instability is analyzed in a bumpy configuration using a relativsly simple fluid model of an inhomogeneous slab plasma with grativational field simulating the bad curvature effect and the grad-B effect due to hot electron annulus. Mathieu type equation is derived to investigate a linear analysis. Stability boundary giving the maximum stable Beta sub p (beta value of bulk plasma) as a function of Beta sub h and the threshold for Beta sub h (beta value of hot electron annulus) are studied for Nagoya bumpy torus parameters. The relevance of our theoretical analysis is discussed in a comparison with the previous results. J.M.S.

N80-16881# Nagoya Univ. (Japan).
FINITE TEMPERATURE EFFECT OF RAY TRACING NEAR THE ELECTRON CYCLOTRON RESONANCE
M. Tanaka, M. Fujiwara, and H. Ikegami Nov. 1979 28 p refs
(IPPJ-427) Avail: NTIS HC A03/MF A01

Ray trajectories and power absorption of electromagnetic wave propagating in an inhomogeneous plasma are investigated in the frequency region near the electron cyclotron resonance. Plasmas are assumed to be cylindrical with the toroidal effect on magnetic field taken into consideration. Finite temperature effect on ray tracing is studied in detail by applying the geometrical optics to a warm plasma, and it is found that the geometrical optics cannot be applied in the region of the electron cyclotron resonance, where the group velocity does not coincide with the velocity of energy flow. Author

N80-16882# Nagoya Univ. (Japan). Inst. of Plasma Physics.
A TWIN OPTICALLY-PUMPED FAR-INFRARED CH3OH LASER FOR PLASMA DIAGNOSTICS
M. Yamanaka, Y. Takeda, S. Tanigawa, A. Nishizawa, N. Noda, M. Shimobayashi, Y. Hayashi, T. Koizumi, K. Nagasaka, S. Okajima et al Nov. 1979 35 p refs
(IPPJ-428) Avail: NTIS HC A03/MF A01

A twin optically-pumped FIR CH3OH laser composed of two identical waveguide resonators was constructed for the modulated interferometer system to be applied to the JIPP T-2 Tokamak machine. The anti-symmetric doublet due to the Raman-type resonant two-photon transition is reproducibly observed at 118.8 micron m. With the 118.8-micron m line, the frequency separation of the anti-symmetric doublet indicates that the CH3OH absorption line center is 16 + or - 1 MHz higher than the pump 9.7-micron P(36) CO2 laser line center. It is shown that the Raman-type resonant two-photon transition is useful in getting several-MHz phase modulations for the far-infrared laser interferometer. Some preliminary performances of this twin laser for the modulated interferometer are described. A.R.H.

N80-16883# Nagoya Univ. (Japan). Inst. of Plasma Physics.
WHISTLER WAVE TRAPPING IN A DENSITY CREST
H. Sugai, H. Niki, M. Inutake, and S. Takeda Nov. 1979 32 p refs

(IPPJ-429) Avail: NTIS HC A03/MF A01

The linear trapping process of whistler waves in a field aligned density crest is investigated theoretically and experimentally below omega = omega sub c/2. The conditions of the crest trapping are derived in terms of the frequency omega/omega sub c, the incident wave normal angle theta sub i, and the density ration n sub i/n sub o. The oscillation length of the trapped ray path for a parabolic density profile is calculated. The phase and amplitude profile of the whistler wave measured along and across the crest is discussed. The experiment on antenna excited whistler wave performed in a large magnetized plasma with the density crest is described, the theory of the crest trapping is presented, bearing the antenna excitation experiments in mind, and the experimental apparatus and method are reported. A.W.H.

N80-16884# Vanderbilt Univ., Nashville, Tenn. Dept. of Physics and Astronomy.

***PRODUCTION AND DIAGNOSTICS OF DENSE NUCLEAR PLASMAS* Final Report, 1 Sep. - 31 Aug. 1979**

Ja H. Lee Aug. 1979 81 p refs

(Grant NsG-1235)

(NASA-CR-162656) Avail: NTIS HC A05/MF A01 CSCL 20I

Dense nuclear plasmas were produced in devices with three different geometries, namely a Mather-type dense plasma focus (DPF), a hypocycloidal pinch (HGP), and a staged plasma focus (SPF). The basic mechanism common to all three geometries was a strong zeta pinch of the current sheets which was launched from the insulator surface by an inverse zeta pinch. The HCP and the SPF are geometrical variances of the Mather-type plasma focus and have significant advantages over the Mather-type device. R.C.T.

N80-16885*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMMENTS ON TEC TRENDS

James F. Morris 1979 28 p refs Presented at Intern. Conf. on Plasma Sci., Montreal, 4-6 Jun. 1979; sponsored by IEEE

(NASA-TM-79317; E-273) Avail: NTIS HC A03/MF A01 CSCL 20I

A technology assessment of thermionic energy conversion research and technology is presented. R.E.S.

N80-16886*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EXPERIMENTS ON H2-02MHD POWER GENERATION

J. Martin Smith 1980 18 p refs Proposed for presentation at the 3d World Hydrogen Energy Conf., Tokyo, 23 - 26 Jun. 1980

(NASA-TM-81424) Avail: NTIS HC A02/MF A01 CSCL 20I

Magnetohydrodynamic power generation experiments utilizing a cesium-seeded H2-02 working fluid were carried out using a diverging area Hall duct having an entrance Mach number of 2. The experiments were conducted in a high-field strength cryomagnet facility at field strengths up to 5 tesla. The effects of power takeoff location, axial duct location within the magnetic field, generator loading, B-field strength, and electrode breakdown voltage were investigated. For the operating conditions of these experiments, it is found that the power output increases with the square of the B-field and can be limited by choking of the channel or interelectrode voltage breakdown which occurs at Hall fields greater than 50 volts/insulator. Peak power densities of greater than 100 MW/cu M were achieved. A.R.H.

N80-16887# Addis Translations International, Portola Valley, Calif.

HYDRODYNAMIC EQUILIBRIUM OF PLASMA IN AN AMBIPOLAR TRAP

G. V. Stupakov Jun. 1979 25 p refs Transl. into ENGLISH of report IYAF-78-93 from Academy of Sciences (USSR), Novosibirsk, 1978 p 1-21 Sponsored by DOE Prepared for California Univ., Lawrence Livermore Lab.

(UCRL-Trans-11493; IYAF-78-93) Avail: NTIS HC A02/MF A01

Hydrodynamically equilibrium plasma configurations in an ambipolar trap are investigated. It is shown that with allowance for the finite value of beta the constant pressure surfaces on the long part of the center mirror cell are distorted and in general are not circular cylinders. The effects of the distortion of the surfaces in relation to the selection of the mirror field are described. DOE

N80-16888# Addis Translations International, Portola Valley, Calif.

PLASMA PHYSICS AND PROBLEMS OF CONTROLLED THERMONUCLEAR REACTIONS

V. T. Tolok, ed. Jun. 1979 166 p refs Transl. into ENGLISH of Kharkov. Fiziko-Tekhnicheskij Inst. (USSR), v. 77, no. 39, 1977 164 p

(UCRL-Trans-11487) Avail: NTIS HC A08/MF A01

Contents: (1) integral model of a pulsed coaxial plasma gun; (2) investigation of the operation of a pulsed coaxial plasma gun in the MHD approximation; (3) investigation and optimization of high power electrodynamic plasma accelerators; (4) turbulent processes in a pulsed coaxial plasma gun; (5) investigation of neutron and X-ray radiation on the MK-200 device; (6) measurement of neutron yield from the plasma of a coaxial gun; (7) formation of shock waves in high density plasma bunches on impact from a magnetic barrier; (8) investigation of high energy plasma burst formation in a complex plasma injector system; and (9) peculiarities of beam formation from a moving dense plasma for spectral analysis of the ion component. A.R.H.

N80-16889# Illinois Univ., Urbana.

STABILITY OF THE FIELD-REVERSED MIRROR Ph.D. Thesis

E. C. Morse 1979 109 p refs

(Contract EY-76-S-02-2218)

(COO-2218-136) Avail: NTIS HC A06/MF A01

The stability of a field reversed mirror plasma configuration is studied with an energy principle derived from the Vlasov equation. The stability properties of a field reversed mirror are compared with the stability properties of similar magnetohydrodynamic equilibria. The Vlasov energy principle developed is applied to a computer simulation of an axisymmetric field reversed mirror state. Techniques for suppressing instabilities are outlined, and the applicability of the Vlasov energy principle to more complicated equilibrium models is shown. DOE

N80-16890# California Univ., Livermore. Lawrence Livermore Lab.

REVIEW OF ELECTRON-BEAM HEATING OF MAGNETIC MIRROR CONFINED PLASMAS, WITH APPLICATION TO THE TANDEN MIRROR EXPERIMENT

M. Seidl 10 Apr. 1979 42 p refs

(Contract W-7405-eng-48)

(UCRL-52759) Avail: NTIS HC A03/MF A01

Results from early electron-beam heating experiments and more recent basic beam-plasma physics experiments are presented. Present theoretical understanding is examined. It is concluded that rather simple electron-beams could be employed on the tandem mirror experiment (TMX) to carry out electron heating experiments. DOE

N80-16891# Oak Ridge National Lab., Tenn.

HIGH BETA TOKAMAKS

R. A. Dory, D. P. Berger, L. A. Charlton, J. T. Hogan, J. K. Munro, D. B. Nelson, Y. K. M. Peng, D. J. Sigmar, and D. J. Strickler 1978 18 p refs Presented at the Conf. on Plasma Phys. and Control, Innsbruck, 23 Aug. 1978

(Contract W-7405-eng-26)

(CONF-780811-23) Avail: NTIS HC A02/MF A01

MHD equilibrium, stability, and transport calculations are made to examine the accessibility and behavior of high beta Tokamak plasmas in the range beta approximately 5 to 15 percent. Results from flux conserving Tokamak models, classical models, and models with spatially resolved transport which include effects from sawtooth oscillations and magnetic islands are discussed. A.W.H.

N80-16892# Oak Ridge National Lab., Tenn. Fusion Energy Div.

HYDROGEN PELLET FUELING EXPERIMENT ON THE ISX-A TOKAMAK

S. L. Milora, C. A. Foster, P. H. Edmonds, and G. L. Schmidt

(Princeton Univ.) Oct. 1978 14 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6496) Avail: NTIS HC A02/MF A01

Experiments on the ISX-A Tokamak which demonstrate the technique of plasma fueling by solid hydrogen pellet injection are reported. The effects on plasma stability, confinement, and plasma density are discussed. DOE

N80-16893# General Dynamics/Convair, San Diego, Calif.
CONFIRMATORY ANALYSIS AND DETAIL DESIGN OF THE MAGNET SYSTEM FOR MIRROR FUSION TEST FACILITY (MFTF)
R. E. Tatro and R. W. Baldi Oct. 1978 62 p
(Contract W-7405-eng-48)
(UCRL-13923; CASD-LLL-78-007) Avail: NTIS
HC A04/MF A01

A confirmatory analysis of the mirror fusion test facility (MFTF) magnet system conceptual design is presented. A thermal analysis of magnet cooldown and warmup is discussed and design analysis of the magnet thermal shield systems and structural supports is reported. A cryostability analysis of the MFTF magnet conductor is presented and the structural integrity of the MFTF magnet case, jacket, and shield system is examined. A.W.H.

N80-16894# Los Alamos Scientific Lab., N. Mex.
MIRROR POSITION DISPLAY EQUIPMENT FOR THE *TARGET CHAMBER MIRROR MOUNTS OF THE LASL* HELIOS LASER FUSION FACILITY
F. D. Wells and D. A. Remington 1979 6 p Presented at the *IEEE Region Six Conf., Sacramento, Calif., 25 Apr. 1979*
(Contract W-7405-eng-36)
(LA-UR-79-569; CONF-790427-1) Avail: NTIS
HC A02/MF A01

Equipment was fabricated which records the absolute positions of sixteen mirror mounts used to direct and focus eight high-energy laser beams for research in laser induced fusion. Each mirror mount is driven by three stepping motors, controlled to produce the motions of focus, tilt, and rotate relative to the target. Stepping of the motors is sensed by incremental optical encoders coupled to the motor drive shafts. Outputs from the encoder tracks are multiplexed to a microprocessor which transmits motor step information via a fiber optical data link to a mirror position display chassis. This unit accumulates the steps, stores the motor positions, displays mirror positon data to the operator, and provides the equipment control functions. Standby battery power is included to retain the motor step data in the event of power failure. DOE

N80-16895# Science Applications, Inc., Boulder, Colo. Lab. for Applied Plasma Studies.
AXIS ENCIRCLING ION GYRO-RADIUS
P. J. Catto, R. E. Aamodt, M. N. Rosenbluth (Princeton Univ.), *J. A. Byers, and L. D. Pearlstein Jun. 1979 27 p refs Prepared jointly with Lawrence Livermore Lab., Calif.*
(Contracts EY-76-C-03-1018; W-7405-eng-48)
(SAI-79-023-766-LJ; LAPS-188) Avail: NTIS
HC A03/MF A01

An idealized plasma model in which all the ion guiding centers lie along the magnetic axis of a cylindrically symmetric plasma was investigated. The radial eigenvalue equation was derived and solved for this strongly unstable limit. Many of the physical features predicted by simple analytic limits of the WKB phase integral condition were verified by a comparison with the results of a particle simulation. DOE

N80-16896# Oak Ridge National Lab., Tenn.
NCMART: ALGORITHMS AND COMPUTER CODES FOR A MODIFIED ALGEBRAIC SPATIAL RECONSTRUCTION OF SPECTROSCOPIC EMISSIVITIES FOR ELMO BUMPY TORUS
K. H. Carpenter and N. H. Lazar Nov. 1978 66 p refs
(Contract W-7405-eng-26)
(ORNL/TM-6500) Avail: NTIS HC A04/MF A01

A modification of the algebraic reconstruction technique first used in tomography is applied to two dimensional spatial resolution of spectroscopic data from the ELMO Bumpy Torus (EBT) taken in two fan views from ports at the top and side of the midplane of a mirror section. The reconstruction algorithms are derived and a description is given of the code implementing them for the EBT data on a PDP-10 computer. Test problem results show that reliable information on impurity distributions in the cross section viewed may be obtained by this method. Instructions for use of the computer codes are included, along with source program listings and sample output from a run using experimental data. DOE

N80-16897# Aerospace Corp., Los Angeles, Calif. Aerophysics Lab.
FUSION LASER STUDIES Final Report, 21 May - 21 Nov. 1978
J. S. Whittier, J. J. T. Hough, R. L. Wilkins, R. W. F. Gross, R. Holland, Jr., J. F. Bott, N. Cohen, and C. P. Wang Dec. 1978 77 p refs
(Contract ED-78-C-08-1559)
(NVO-1559-1) Avail: NTIS HC A05/MF A01

Computer modeling of short pulse HF chemical lasers is discussed. Disagreements between laser code predictions and short pulse laser experiments are examined. The introduction of treatments for initiation and energy loss mechanisms, and the consideration of initiation nonuniformities are evaluated for reducing uncertainties between code predictions and experimental observations. Areas of work required to reduce the remaining modeling uncertainties are identified. DOE

N80-16898# Sandia Labs., Albuquerque, N. Mex.
PARTICLE BEAM INTERACTIONS WITH PLASMAS AND *THEIR APPLICATION TO INERTIAL FUSION*
M. J. Clauser, E. J. T. Burns, and J. Chang 1979 8 p refs Presented at the Conf. Intern. sur les Phenomenes D'ionisation *dans les Gaz, Grenoble, France, 9 Jul. 1979*
(Contract EY-76-C-04-0789)
(SAND-79-1411C; CONF-790708-4) Avail: NTIS
HC A02/MF A01

The basic principles of fusion target implosions and the particle beam characteristics required to ignite the targets are summarized. The interaction of light ion beams and electron beams with fusion target plasmas is discussed. An historical review of the pulse power approach to inertial fusion is given. DOE

N80-16899# Los Alamos Scientific Lab., N. Mex.
***SYSTEMS-DESIGN AND ENERGY-BALANCE CONSIDERA-*TIONS FOR IMPACT FUSION**
R. A. Krakowski and R. L. Miller 1979 27 p refs Presented at the DOE Impact Fusion Workshop, Los Alamos, N. Mex., 10 Jul. 1979
(Contract W-7405-eng-36)
(LA-UR-79-1969; CONF-790741-4) Avail: NTIS
HC A03/MF A01

Areas of concern and potential problems for impact fusion are considered. A parametric and qualitative description of the general energy balance and systems considerations for an Impact Fusion Reactor (IFR) design are reported. Reactor systems design considerations for an IFR are presented. The IFR viability is assessed based on projectile target energy balances and thermonuclear burn models. DOE

N80-16900# Massachusetts Inst. of Tech., Cambridge. Dept. of Nuclear Engineering.
ASPECTS OF TOKAMAK TOROIDAL MAGNET PROTECTION
R. W. Green and M. S. Kazimi Jul. 1979 198 p refs
(Contract EY-76-S-02-2431)
(COO-2431-6; PFC/TR-79-6) Avail: NTIS HC A09/MF A01

Geometric models were used to estimate the potential for damage to a Tokamak reactor inner wall and blanket due to a toroidal magnet field collapse. The only potential hazard found to exist was due to the MHD pressure rise in a lithium blanket. A survey of proposed protection methods for superconducting toroidal magnets was conducted. Computer programs were developed which allowed the toroidal magnet set to be modeled as a set of circular filaments. A thermal model of the conductor was used which allowed heat transfer to the magnet structure and which included the effect of temperature dependent properties. A protection system design procedure was developed. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

N80-16901 *Stanford Univ., Calif.*
PICOSECOND DYNAMICS OF ENERGY TRANSFER IN PURE AND MIXED ORGANIC CRYSTALS Ph.D. Thesis
Dana Donald Dlott 1979 137 p
Avail: Univ. Microfilms Order No. 8001906

Intermolecular interactions in molecular crystals which give rise to electronic excitation transport are studied. Experimental investigations of the wide variety of radiative and radiationless transitions which occur in molecular crystals are discussed. The application of the techniques of picosecond time resolved spectroscopy to the study of radiationless processes including excimer formation, phonon effects, and excited state energy transport is reported. Several observables which depend on excited state mobility are discussed and in particular it is shown that the picosecond transient grating technique permits direct determination of excited state mobility by introducing a well defined distance scale directly in the sample. Dissert. Abstr.

N80-16902 California Univ., Berkeley.
LOW ENERGY ELECTRON DIFFRACTION AND AUGER ELECTRON SPECTROSCOPY STUDIES OF THE STRUCTURE AND CHEMISTRY OF IRON SINGLE CRYSTAL SURFACES Ph.D. Thesis
Clifford Alan Megerle 1979 346 p
Avail: Univ. Microfilms Order No. 8000441

The techniques of low energy electron diffraction and Auger electron spectroscopy were used to study the structure, the Debye temperature and the adsorption behavior of several iron and vanadium single crystal surfaces. Clean Fe(110), Fe(111) and Fe(100) surfaces were obtained after the removal of sulfur impurities by a two step process involving (1) the heating of the sample to a temperature of 850 C in a flowing stream of hydrogen at a pressure of one atmosphere and for a period of approximately four weeks, follwed by (2)several ion bombardment-anneal cycles. Dissert. Abstr.

N80-16903 California Univ., Berkeley.
STUDIES OF ELECTRON CORRELATION IN THE PHOTOIONIZATION PROCESS Ph.D. Thesis
Richard Allen Rosenberg 1979 200 p
Avail: Univ. Microfilms Order No. 8000493

Electron correlation, the interaction of two or more electrons confined in a region of space, was treated under the formalism of configuration interaction (CI). The types of CI involved in the photoionization process was divided into three categories: initial state configuration interaction, final ionic state configuration interaction, and continuum state configuration interaction. The experimental studies which reveal how the various types of CI may become manifested in photoionization are examined. The experimented methods utilized in the work were photoelectron spectroscopy (PES), electron impact spectroscopy (EIS), and time resolved fluorescence spectroscopy. Dissert. Abstr.

N80-16904 California Inst. of Tech., Pasadena.
THEORETICAL STUDIES OF BOUND EXCITON DECAY AND OF TRANSPORT ACROSS SEMICONDUCTOR INTERFACES Ph.D. Thesis
Gordon Cecil Osbourn 1979 164 p
Avail: Univ. Microfilms Order No. 7920345

Calculations of the phononless Auger and radiative transition rates for excitons bound to the four common shallow acceptors (B, Al, Ga and In) in Si and Ge are presented. The calculation of radiative transition rates is compared to estimates obtained from absorption experiments. Calculations for the Auger and radiative recombination rates for acceptor bound excitons in the Hg-CdTe alloy system and in GaAs are discussed. Calculations of reflection and transmission coefficients for electrons and holes at abrupt and graded (100) interfaces for the GaAs-Ga sub 1-x Al sub x As system are presented. The calculations are performed using the empirical tight binding approximation. The dependence of the transport coefficients on the alloy composition was investigated. The effect of the distance over which the interface is graded on the transport coefficients was examined. A theoretical study of impact ionization in heterojunction systems is reported. Dissert. Abstr.

N80-16905 North Texas State Univ., Denton.
CO2-LASER INDUCED HOT ELECTRON MAGNETO-TRANSPORT EFFECTS IN n-InSb Ph.D. Thesis
Bradley Thomas Moore, Jr. 1979 204 p
Avail: Univ. Microfilms Order No. 800795

The effects of optical heating via infrared free carrier absorption on the electron magneto-transport properties of n-InSb at helium temperatures was studied. A CO2 laser was used as the optical source. The photoexcited electrons generated by the free carrier absorption were found to relax their excess energy by emitting a maximum number of optical phonons before electron-electron scattering distributed the remaining energy to the bulk conduction band electron gas. The Shubnikov-de Haas (SdH) oscillations in the magnetoresistance were used to monitor the electron temperature. The application of the SdH effect to the study of optical heating is discussed. Dissert. Abstr.

N80-16906 Cincinnati Univ., Ohio.
MOSSBAUER MEASUREMENTS ON LOW TEMPERATURE DEUTERON IMPLANTED Al(Co57) Ph.D. Thesis
Tomi Louis Marcuso 1979 149 p
Avail: Univ. Microfilms Order No. 8002123

In situ Mossbauer measurements were performed on the dilute alloy Al(Co(57)) following low temperature deuteron implantations obtained from the 2.5 MeV Van de Graaff accelerator. The irradiations produced a satellite absorption resonance in the Mossbauer spectra which was defined as a Lorentzian doublet. The results were compared to other Mossbauer investigations of the same system after low temperature neutron and electron irradiations. A description of the experimental equipment and associated low temperature irradiation performance is presented. The procedure used to make the dilute, substitutional Al(Co(57)) alloy is discussed, and, based on this procedure, a substitutional cosolubility limit was estimated. Mossbauer results concerning coprecipitation from solid solution are presented: the incomplete recovery of the spectra following irradiation is tentatively associated with coprecipitation thermally activated by thermal spike mechanisms. Dissert. Abstr.

N80-16907 Wisconsin Univ. - Madison.
CALCULATION OF LOCAL FIELDS IN CUBIC LATTICES OF POLARIZABLE ATOMS Ph.D. Thesis
Alfred Paul Lehnen 1979 273 p
Avail: Univ. Microfilms Order No. 7927184

The response of cubic lattices of polarizable atoms to static electric fields is treated. A series solution in powers of the polarizability is obtained for the self-consistent dipole-field equations. Two cases are considered in detail, a uniform field and the field of a point charge. For the uniform field, an exact calculation is made for the maximum value of the polarizability for which there exists a solution to the dipole-field equations. For the simple cubic lattice, results are obtained which are smaller than the Clausius-Mosotti limit. It is shown that the deviation of the atomic dipole from the continuum result drops exponentially with distance from the crystal surface. A normal mode analysis of an infinite lattice of Drude-model atoms is done to identify the limiting polarizability for more general nonuniform fields. Dissert. Abstr.

N80-16908 Nebraska Univ. - Lincoln.
TESTS OF NEW THEORIES FOR CRYSTAL ANHARMONICITY Ph.D. Thesis
Bruce W. Jones 1979 191 p
Avail: Univ. Microfilms Order No. 8000897

Two theories of crystal anharmonicity were tested. The uncorrelated-pairs approximation (UPA) is used to determine the equilibrium thermodynamic properties of systems with different model potentials. A generalization of the self-consistent phonon (SCP) approximation is developed to treat the problem of a displacive phase transition. Quantum-mechanical corrections and three-body forces were included in the harmonic approximation only, and very good agreement with Monte Carlo results was obtained. The UPA is simple to apply and is more accurate at

high temperatures than the so-called improved self-consistent phonon approximation. Dissert. Abstr.

N80-16909 Texas Univ. at Austin.
DYNAMICS NEAR THE PHASE TRANSITIONS IN LIQUID CRYSTALS Ph.D. Thesis
Khurshid Akhter Hossain 1979 111 p
Avail: Univ. Microfilms Order No. 7928303

A general formalism is developed to study the dynamics near the nematic to smectic phase transitions in liquid crystals. This formalism is cast in such a form that the very successful dynamic renormalization group method can be applied. The contributions to the viscosities which enter the stress tensor in the nematic state of a liquid crystal and the twist viscosity gamma sub 1, for the order parameter fluctuations near the nematic-smectic A, nematic-smectic C transitions and the Lifshitz point are calculated. The parameter which describes the reversible coupling between the shear and the director is also obtained. The calculational scheme involves a mode-coupling method. These results are compared with those of Jahnig and Brochard near the nematic-smectic-A transition. The dynamics of the NA transition is also investigated by the renormalization group method. Dissert. Abstr.

N80-16910 Arizona State Univ., Tempe.
AN INVESTIGATION OF CRYSTAL SURFACE STRUCTURE BY REFLECTION ELECTRON DIFFRACTION Ph.D. Thesis
Gary George Hembree 1979 136 p
Avail: Univ. Microfilms Order No. 8000942

Enhancement of the crystallographic contrast present in scanning electron micrographs formed by the secondary electron output from specimens of pyrolytic graphite was observed at glancing incident beam angles. A program of experimental observations of the angular dependence of the secondary electron image contrast and reflection electron diffusion (RED) patterns was carried out utilizing an instrumental system which combines scanning electron microscopy (SEM) and RED in an ultra high vacuum environment. The experimental results were interpreted with the help of computed RED intensities and Bloch wave extinction depths. These were obtained from a program based on an n beam dynamical electron diffraction formulation. The results of this comparison showed that the enhanced crystallographic contrast originated from variations in the penetration depth of the incident electron beam caused by different azimuthal incidence angles with respect to the crystal lattice. Dissert. Abstr.

N80-16911 Princeton Univ., N. J.
COMPARATIVE LOW ENERGY ELECTRON DIFFRACTION STUDIES OF InSb(110) AND GaAs(110) SURFACES Ph.D. Thesis
Jwu-Lin Yeh 1979 123 p
Avail: Univ. Microfilms Order No. 7928496

The structural search using kinematical calculations of the intensities of normally incident low energy electrons diffracted from InSb(110) and the structural refinement afterwards using dynamical calculations is discussed. A surface structure model revealing InSb(110) top three layer atomic reconstructions through a comparison with the measured intensities is presented. The findings from ELEED analysis on InSb(110) surface are compared with the results of the previous studies of GaAs(110) from different directions such as the characteristics of normal-incidence and CMTA data, the scattering factors of the constituent atoms, the procedure of structure determination, the finally proposed structural parameters, and some other physical properties of these two III-V covalently bonded compound semiconductors. The introduction of an appropriate Debye-Waller factor for a diatomic material and the usefulness of the low temperature LEED intensity data are reported. Dissert. Abstr.

N80-16912 Maryland Univ., College Park.
GINZBURG-LANDAU THEORY AND THE SUPERCONDUCTING TRANSITION IN THIN, AMORPHOUS BISMUTH FILMS Ph.D. Thesis
Deborah VanVechten 1979 243 p
Avail: Univ. Microfilms Order No. 8002078

The calculation of the effect of (b/2)((the absolute value of psi) squared) squared on the fluctuation conductivity in three different approximations is presented. The predictions are compared to data on thin amorphous bismuth films. The first approximation calculates the contribution to the fluctuations' self energy of the tadpole diagrams. The values of the theoretical equation's fitting parameters were determined by a least squares method and turn out to depend on film thickness in the manner predicted by the theory. Dissert. Abstr.

N80-16913 Rutgers - The State Univ., New Brunswick, N. J.
SURFACE DEFECTS IN WEAKLY DEFORMED SINGLE CRYSTAL SILICON AND THEIR EFFECT ON INTERFACE PROPERTIES OF MOS CAPACITORS Ph.D. Thesis
Krishna Murty 1979 218 p
Avail: Univ. Microfilms Order No. 7928428

A quantitative correlation is established between the induced stresses and the electronic properties of the MOS capacitor and MOSFET device. X-ray topographic evidence showed that sputtered Ta films induce strain resulting in microplastic defects at the surface of Si wafer as shown on the X-ray section topographs. These defects are most likely caused by incorporation of Ta atoms in Si lattice. Auger electron spectroscopy has shown that implanted Ta atoms diffuse through SiO2 and reach Si surface. Dislocation etching followed by SEM examination verified X-ray topographic evidence of the location of defects on Si surface. Dissert. Abstr.

N80-16914*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PLANAR MULTIJUNCTION HIGH VOLTAGE SOLAR CELLS
John C. Evans, Jr., An-Ti Chai, and Chandra Goradia (Cleveland State Univ., Ohio) 1980 10 p refs Presented at 14th Photovoltaic Specialists Conf., San Diego, Calif., 7-10 Jan. 1980; sponsored by IEEE
(NASA-TM-81389; E-299) Avail: NTIS HC A02/MF A01 CSCL 20L

Technical considerations, preliminary results, and fabrication details are discussed for a family of high-voltage planar multijunction (PMJ) solar cells which combine the attractive features of planar cells with conventional or interdigitated back contacts and the vertical multijunction (VMJ) solar cell. The PMJ solar cell is internally divided into many voltage-generating regions, called unit cells, which are internally connected in series. The key to obtaining reasonable performance from this device was the separation of top surface field regions over each active unit cell. Using existing solar cell fabricating methods, output voltages in excess of 20 volts per linear centimeter are possible. Analysis of the new device is complex, and numerous geometries are being studied which should provide substantial benefits in both normal sunlight usage as well as with concentrators. A.R.H.

N80-16915# Army Military Personnel Center, Alexandria, Va.
STRUCTURAL PROPERTIES OF Nb3Sn DIFFUSION LAYERS FABRICATED ON SINGLE CRYSTAL Nb SUBSTRATES M.S. Thesis. Final Report
James Frederick DeBroux 4 Sep. 1979 146 p refs
(AD-A074738) Avail: NTIS HC A07/MF A01 CSCL 13/13

The structural properties of Nb3Sn diffusion layers fabricated on oriented single crystal Nb substrates exhibit systematic behaviors based on substrate orientation which result from interactions between the substrates and A15 overlayers. Preferred orientation of the diffusion layers is confirmed by X-ray and electron diffraction measurements. Within the bulk of a specific Nb(hkl) substrate layer, the preferred orientation appears to be a function of layer thickness for the range of thicknesses studied (or 1 to 17 micrometers). It is believed to develop over distance due to a competition between the growth region orientation at the advancing interface (required by lattice registry of the bcc and A15 lattices) and the tendency of Nb3Sn layers toward a natural growth direction, A15(100); this competition is moderated by in situ annealing of the Nb3Sn as growth advances. Consistent with this model is the fact that surface preferred orientation of a diffusion layer on a given Nb(hkl) substrate, both for as-grown surfaces and for internal surfaces exposed by etching, appears to be a function of net layer thickness. GRA

N80-16916# Ames Lab., Iowa.
MAGNETIC CRITICAL TEMPERATURE GAP IN Gd-Y ALLOYS

S. Legvold, P. Burgardt, and B. J. Beaudry 1979 11 p refs Presented at the Intern. Conf. on Magnetism, Munich, Sep. 1979 Prepared jointly with Iowa State Univ. of Science and Technology, Ames
(Contract W-7405-eng-82)
(ISM-228; CONF-790909-8) Avail: NTIS HC A02/MF A01

In a search for Lifshitz points, a very interesting and complex region in the magnetic phase diagram of Gd-Y alloys near 30 atomic percent Y was found. An Apparent jump (gap) in the highest ordering temperature and perplexing magnetic behavior for samples near this expected Lifshitz point concentration was observed. DOE

N80-16917# Brookhaven National Lab., Upton, N. Y.
PHONON SCATTERING IN METALLIC GLASSES
J. L. Black 1979 9 p refs Presented at the 3d Intern. Conf. on Phonon Scattering, Providence, 28 Aug. 1979
(Contract EY-76-C-02-0016)
(BNL-26610; CONF-790862-3) Avail: NTIS HC A02/MF A01

Theoretical and experimental developments in the study of metallic glasses at temperatures near or below 1K are presented. In this temperature regime, it appears that practically all glasses, whether metallic or insulating, behave in a similar fashion. The fact that such similarities occur, despite substantial structural differences between metallic and insulating glasses, constitutes a major theoretical challenge. The evidence for universal behavior and the theory which is necessary to understand this evidence are emphasized. Most of this evidence involves a comparison of phonon scattering in metallic glasses with its counterpart in insulating glasses. DOE

N80-16918# Ames Lab., Iowa.
ALLS, A GENERALIZED CRYSTALLOGRAPHIC LEAST SQUARES PROGRAM
R. L. Lapp and R. A. Jacobson Aug. 1979 72 p refs
(Contract W-7405-eng-82)
(IS-4708) Avail: NTIS HC A04/MF A01

A program was written in FORTRAN for the least squares refinement of single crystal X-ray diffraction data. The program uses the same methods to handle symmetry, calculate derivatives, and invert the matrix as ORFLS, but includes options for block diagonal matrix refinement, secondary extinction refinement, reuse of the matrix on successive cycles, and several input/output options to improve the program's efficiency and utility. A complete listing of the program and detailed instructions for its use are included. DOE

N80-16919# Sandia Labs., Albuquerque, N. Mex.
RADIATION-HARDENED BULK CMOS TECHNOLOGY
W. R. Dawes, Jr. and D. H. Habing 1979 7 p refs Presented at the Computers in Aerospace Conf., Los Angeles, 22 Oct. 1979
(Contract EY-76-C-04-0789)
(SAND-79-0714C; CONF-791040-1) Avail: NTIS HC A02/MF A01

The evolutionary development of a radiation-hardened bulk CMOS technology is reviewed. The metal gate hardened CMOS status is summarized, including both radiation and reliability data. The development of a radiation-hardened bulk silicon gate process, which was successfully implemented to a commercial microprocessor family and applied to a new, radiaton-hardened, LSI standard cell family, is also discussed. The cell family is reviewed and preliminary charctenzation data is presented. Various radiation-hardened technologies are compared with regard to performance, reliability, and availability is made. DOE

N80-16920# Oak Ridge National Lab., Tenn.
EQUILIBRIUM PROPERTIES OF THE FLUXOID LATTICE IN SINGLE-CRYSTAL NIOBIUM
H. R. Kerchner, D. K. Christen, S. T. Sekula, and P. Thorel Jun. 1979 12 p refs Presented at Superconductivity in d- and f-Band Metals, San Diego, Calif., 21 Jun. 1979 Submitted for publication
(Contract W-7405-eng-26)
(CONF-790653-2) Avail: NTIS HC A02/MF A01

The dimensions and symmetry of the fluxoid lattice in a single-crystal sphere of niobium were measured by using a double-perfect-crystal small-angle neutron-scattering technique (DCSANS). The bulk magnetization of the same sample was measured by a field-sweep technique. In addition, the misalignment between the fluxoids and the applied magnetic field was observed by DCSANS. The findings are reported, and the measurements are compared with realistic microscopic theory where it is available. DOE

N80-16921# California Univ., Livermore. Lawrence Livermore Lab.
SURFACE SELF-DIFFUSION OF GERMANIUM AND SILICON
D. M. Makowiecki and J. B. Holt 11 Jun. 1979 12 p refs Presented at the 5th Intern. Conf. on Sintering and Related Phenomena, Notre Dame, Ind., 18 Jun. 1979
(Contract W-7405-eng-48)
(UCRL-82865; CONF-790682-4) Avail: NTIS HC A02/MF A01

Surface self-diffusion was investigated by measuring the smoothing of surface profiles on germanium and silicon single crystals. The profiles generally would not change when the crystals were annealed in vacuum. However, removal of oxide films by a reducing atmosphere or flash heating yielded samples that changed their profiles considerably upon annealing. This evidence indicates that surface oxide films are stopping surface diffusion on these crystals. Preliminary data yield values for the surface-diffusion coefficients that are not particularly low when compared with those of metals. However, the data indicate low volume-diffusion coefficients for silicon and germanium, which may contribute to the nonsinterability of these materials. DOE

N80-16922# Bendix Corp., Kansas City, Mo.
SHELF-LIFE DETERMINATION OF EPOXY PREPREGS AND FILM ADHESIVES
B. G. Parker and C. H. Smith 1978 17 p refs
(Contract EY-76-C-04-0613)
(BDX-613-2110) Avail: NTIS HC A02/MF A01

Epoxy prepregs and film adhesives composed of partially cured epoxy resins and, in the case of the prepregs, a fiber matrix, are examined. Differential scanning calorimetry (DSC), a method for performing thermochemical analysis, is discussed and its application to epoxy prepregs for acceptance testing and observing the kinetics of the curing reaction is described. DOE

N80-16923# Argonne National Lab., Ill.
COMPTON SCATTER IN GERMANIUM AND ITS EFFECT OF IMAGING WITH GAMMA-RAY POSITION-SENSITIVE DETECTORS
I. S. Sherman, M. G. Strauss, and R. Brenner 19 Oct. 1978 12 p refs Presented at IEEE Nucl. Sci. Symp., San Francisco, 19 Oct. 1978
(Contract W-31-109-eng-38)
(CONF-781028-1) Avail: NTIS HC A02/MF A01

The spatial spread due to Compton scatter in Ge was measured to study the reduction in image contrast and signal to noise ratio (S/N) resulting from erroneous readout in Ge position sensitive detectors. The step response revealing this spread was obtained by scanning with a 122 keV gamma ray beam across a boundary of two sectors of a slotted coaxial Ge(Li) detector that is 40 mm in diameter by 22 mm long. DOE

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

N80-16924 California Univ., Berkeley.
STATISTICAL MECHANICS AND FIELD THEORY Ph.D. Thesis
Stuart Alan Samuel 1979 339 p
Avail: Univ. Microfilms Order No. 8000504

The application of field theory methods to statistical mechanics is discussed. In particular, statistical systems are related to fermionic like field theories through a path integral representation. The basic definitions, ideas, and uses of anticommuting variables are presented. The Ising model, the free fermion model, and close packed dimer problems on various lattices are considered. Graphical calculation techniques are developed. The application of statistical mechanics intuition to field theories is also discussed. Certain relativistic field theories are shown to be equivalent to classical interacting gases. The problem of quark confinement is addressed. Dissert. Abstr.

N80-16925 California Inst. of Tech., Pasadena.
MATHEMATICAL MODELING AND EXPERIMENTAL STUDIES OF THERMAL REACTIONS OF COAL Ph.D. Thesis
Ravi Jain 1980 312 p
Avail: Univ. Microfilms Order No. 8000958

A mathematical model based on coal's chemical structure and its reactions is developed for computer simulation pyrolysis. For the purpose of mathematical modeling, coal is considered to be a population of randomly distributed functional groups on a matrix. A scheme based on statistical transformations is devised to compute concentrations of reacting configurations before and during pyrolysis. The rates of reactions are expressed in terms of these concentrations. Differential equations governing the rate of change of state variables with pyrolysis time are formulated and numerically integrated on the computer. The dependence of the yield and composition of volatiles on (1) transport parameters like particle size and pressure, and (2) kinetic parameters like time, temperature and time-temperature history, is investigated. Gaseous products are analyzed using chromatography, while tar is characterized by GPC, NMR, and elemental analysis. Dissert. Abstr.

N80-16926 California Univ., Berkeley.
MOLECULAR THERMODYNAMICS OF DEW-POINT CALCULATIONS IN COAL GASIFICATION PROCESSES Ph.D. Thesis
Abdalla Ibrahim El-Twaty 1979 205 p
Avail: Univ. Microfilms Order No. 8000333

A flow apparatus for dew point measurements suitable for highly asymmetric mixtures at high temperatures is described. The apparatus was used to measure the vapor pressure of anthracene in the temperature range 145-165 C and the solubility of n-hexadecane in methane at 125 C near 600 psig. A molecular thermodynamic model was developed to predict condensation conditions for coal gases. Fugacity coefficients are calculated from the viral equation for the gas-phase. The model is implemented in the form of a computer program which requires as input: the total pressure, weight fractions of all components of the feed and, for each tar cut, one vapor pressure datum, fraction aromaticity, and hydrogen-to-carbon ratio. The program calculates the initial dew point as well as the mole and weight percent of tar and/or water condensed as the temperature falls along the heat exchanger. Dissert. Abstr.

N80-16927# Argonne National Lab., Ill.
HIGH-TEMPERATURE THERMODYNAMIC PROPERTIES OF THE THORIUM-OXYGEN SYSTEM
R. J. Ackermann and M. Tetenbaum 1979 25 p refs Presented at the Intern. Colloq. on Mater. for High-Temperature Energy, Toronto, 16 Jul. 1979 and Intern. Symp. on Thermodyn. of Nucl. Mater., Jeulich, West Germany, 29 Jan. - 2 Feb. 1979
(Contract W-31-109-eng-38)
(CONF-790761-1) Avail: NTIS HC A02/MF A01

Thermodynamic properties of the Th-O system at high temperatures were investigated by means of mass effusion, mass spectrometric, and transpiration techniques over compositions ranging from the congruently vaporizing composition to the lower phase boundary composition. A very sharp decrease in O potential occurs when stoichiometric thoria is reduced but slightly from the stoichiometric composition. The small extent of reduction over a wide range of O potentials measured in the temperature range 2400 to 2655 K is a clear illustration of the higher stability of the ThO sub 2-x phase compared with actinide oxides such as UO sub 2-x, PuO sub 2-x, as well as other metal oxide systems. Estimates of delta H-bar sub O27, delta S-bar sub O2, and the standard free energy of formation of bivariant ThO sub 2-x compositions were made. A substantial increase in the total pressure of Th-bearing species occurs when stoichiometric thoria is reduced toward the lower phase boundary. DOE

N80-16928# Minnesota Univ., Minneapolis. School of Physics and Astronomy.
SOLITON MASSES IN SUPERSYMMETRIC THEORIES
J. F. Schonfeld 1979 32 p refs
(Contract EY-76-C-02-1764)
(COO-1764-363) Avail: NTIS HC A03/MF A01

A systematic mass-calculation procedure derived from the supersymmetry algebra is presented. This method is applied to a large class of two dimensional models, and finds that in O(Dirac constant) the quantum-mechanical mass of a kink differs from its classical mass by a universal expression that has no dependence on the details of the interaction. The difference contains an ultraviolet divergence that exactly cancels the divergence in the classical mass. This contradicts recent claims that the difference must be zero. This result can also be checked using a number of other techniques, but it is argued that in space-times of dimension greater than two only the procedure derived from the supersymmetry algebra is likely to have any practical value. In two dimensions the difference between the quantum and classical masses can be related to properties of the amplitudes with which elementary bosons and fermions are scattered by a kink-antikink pair. These amplitudes satisfy a supersymmetry Ward identity. DOE

N80-16929# Idaho National Engineering Lab., Idaho Falls.
THERPP: A THERMODYNAMIC PROPERTIES PROGRAM
R. S. Deeds Aug. 1979 112 p refs
(Contract EY-76-C-07-1570)
(TREE-1081-Rev) Avail: NTIS HC A06/MF A01

The computer program THERPP, a program that calculates the thermodynamic properties of light hydrocarbons and mixtures of light hydrocarbons, is documented. A specific pressure-temperature or pressure-enthalpy grid is input to obtain properties in the desired region. THERPP is a modification of the program HSGC. Thermodynamic properties are calculated using Starling's modification to the Benedict-Webb-Rubin equation of state. DOE

N80-16930# Texas Univ., Austin. Center for Particle Theory.
INTERACTION BETWEEN CLASSICAL AND QUANTUM SYSTEMS: A NEW APPROACH TO QUANTUM MEASUREMENT. 2: THEORETICAL CONSIDERATIONS
T. N. Sherry and E. C. G. Sudarshan 1978 27 p refs
(Contract EY-76-S-05-3992)
(ORO-3992-342) Avail: NTIS HC A03/MF A01

An approach to the quantum measurement process is developed. In this approach, the apparatus is treated as a classical system; however, the classical apparatus is directly coupled to the quantum system. A principle of integrity, which requires that the observables of the classical apparatus retain their classical integrity, is introduced. The constraints that this principle places upon the coupling between the apparatus and the quantum system are examined. A model loosely based on the Stern-Gerlach experiment is used to illustrate the approach. A coupling which satisfies the principle of integrity is exhibited for this model. DOE

N80-16931# Texas Univ., Austin. Center for Particle Theory.
INTERACTION BETWEEN CLASSICAL AND QUANTUM SYSTEMS: A NEW APPROACH TO QUANTUM MEASUREMENT. 3: ILLUSTRATION
S. R. Gautam, T. N. Sherry, and E. C. G. Sudarshan 1978 28 p refs
(Contract EY-76-S-05-3992)
(ORO-3992-343) Avail: NTIS HC A03/MF A01

In accordance with the approach to quantum measurement in which the apparatus is treated as a purely classical instrument to be described by the laws of classical mechanics, some simple experiments are examined for the purpose of illustration. The Stern-Gerlach experiment is examined in detail: it is seen explicitly how the relevant information is transferred to the apparatus variables. A magnetic interferometer arrangement and a crossed field arrangement are also examined. Consideration of these experiments leads to the inclusion of an extra procedural step

in the approach. This extra step is necessary so that an observer may measure the classical apparatus variables at will after the interaction is completed. DOE

N80-16932# Bureau of Mines, Pittsburgh, Pa. Mining and Safety Research Center.
THERMAL, MECHANICAL, AND PHYSICAL PROPERTIES OF SELECTED BITUMINOUS COALS AND COKES
J. M. Singer and R. P. Tye 1979 44 p refs
(PB-300398/5; BM-RI-8364) Avail: NTIS HC A03/MF A01 CSCL 08I

Thermal, mechanical, and physical properties, of virgin and heat-treated seam coal were determined. Measured properties include thermal conductivity, specific heat, thermal expansion, density, compressive and tensile strength, porosity, and permeability, interdependence among all properties is discussed. GRA

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N80-16933# Pittsburgh Univ., Pa. Dept. of Industrial Engineering.
SCIENTIFIC MANAGEMENT OF THE REPAIRABLE ITEM INVENTORY SYSTEM Final Report
Steven Nahmias 28 Aug. 1979 5 p
(Grant AF-AFOSR-3494-78; AF Proj. 2304)
(AD-A074259; AFOSR-79-0982TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The purpose of this research was to examine a number of existing mathematical models of repairable inventory systems in order to discover possible improvements and/or generalization of existing work in this area of research. The research resulted in two research reports. One deals with a deterministic model for a repairable item inventory system with a finite repair rate. The second report deals with managing repairable item inventory systems. The second paper presents a relatively comprehensive review of the mathematical models which have appeared in the literature for managing inventory systems where items were subject to repair. It deals with both the continuous review models - METRIC and its extensions and periodic review models which are based on dynamic programming formulations. GRA

N80-16934# New York State Assembly Scientific Staff, Albany.
LINKING SCIENCE AND TECHNOLOGY TO PUBLIC POLICY: THE ROLE OF UNIVERSITIES
Abdo I. Baaklini, ed. 1979 156 p Prepared in cooperation with State Univ. New York, Albany
(Grant NSF ISP-75-18374)
(PB80-108202; ISBN-0-915194-03-1; LC-78-22608) Avail: NTIS HC A08/MF A01 CSCL 05A

The nature of the relationship between universities and state governments is addressed from both historical and contemporary perspectives. Benefits to be derived by universities and state governments through mutual cooperation and sources of problems that can arise from close relationships between the two are discussed in edited conference papers. The consensus is that increased cooperation between universities and state governments, particularly in the areas of S & T, will prove highly beneficial to both, provided that the arrangements through which this cooperation is achieved are sufficiently flexible to recognize autonomy of the universities. GRA

N80-16935# British Library, London (England).
REVIEW OF MANAGEMENT INFORMATION FROM COMPUTER-BASED CIRCULATION SYSTEMS IN ACADEMIC LIBRARIES
C. Mary Overton Jun. 1979 36 p
(BLL-BLRDR-5471; ISBN-0-905984-32-3; ISSN-0308-2385) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.: £3.50

The production and use of management information from computer-based circulation libraries in the United Kingdom are reviewed. Statistical, operational, and analytical information categories are described and the potential usefulness of each type is illustrated. Particular attention is paid to archive files. The management information used in fund allocation loan regulation, book buying, and stock management is briefly described. Factors which detract from the value of management information from automated circulation systems are discussed. K.L.

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N80-16936 Nebraska Univ. - Lincoln.
CONTINGENCY FACTORS AFFECTING THE USER INVOLVEMENT ROLE IN THE DESIGN OF SUCCESSFUL INFORMATION SYSTEMS Ph.D. Thesis
Charles Russel Franz 1979 215 p
Avail: Univ. Microfilms Order No. 8001065

A field survey was conducted to test various contingency hypotheses. Different types of user involvement in designing and implementing information systems were examined along with the resultant success of the information systems to the user. User involvement was studied under various organizational and user conditions to determine the effect which these various conditions has upon user involvement as well as the subsequent user-perceived usefulness of the information system. It was concluded that user involvement is an important variable in producing successful information systems. It was emphasized that more attention should be devoted to developing other measures of user involvement and system's success.
Dissert. Abstr.

N80-16937# Union Carbide Corp., Oak Ridge, Tenn. Computer Sciences Div.
EXPERIENCE IN USING THE LIBRARIAN AS AN AID IN MANAGING LARGE-SCALE DATA BASES
J. L. Sexton 1978 15 p Presented at the 2nd Librarian User Group Meeting, Atlanta, 6-7 Mar. 1978
(Contract W-7405-eng-26)
(K/CSD/INF-78/4; CONF-780370-1) Avail: NTIS HC A02/MF A01

The storage, maintenance, and retrieval of many data bases varying widely in size (up to 50,000 records) and associated with each other in a variety of subtly implied ways was studied. A system was devised whereby the data are stored on a librarian master file in a highly atomized form and are retrieved and configured at job submission time on the basis of criteria such as work-package structuring, Engineering Department organizational lines, etc. The simplicity and ease-of-use of Librarian enabled implementation of an on-line data base management system and led to higher benchmarks of responsiveness and reliability than were previously possible. DOE

N80-16938# British Library, London (England). Research and Development Dept.
DESIGNING INFORMATION: SOME APPROACHES, SOME PROBLEMS AND SOME SUGGESTIONS
Patricia Wright 1979 55 p refs
(BLL-BLRDR-5509) Avail: British Library Lending Div., Boston Spa, Engl.

The problems of characterizing the domain of information design are considered. A range of taxonomic classifications that deal with four aspects of communication are provided; the medium (e.g., print/microform), the text itself (e.g., journal article/catalog card), the readers' interaction with the text (e.g., browsing/studying) and researchers' perspectives on information design (e.g., data collection/theory building). Emphasis is given to the value of studying information users and the category of user is broadened to include both the providers as well as the recipients of messages. Suggestions are made concerning areas where further research effort could be usefully directed. M.M.M.

N80-16939# Cambridge Univ. (England).
STATISTICAL BASES OF RELEVANCE ASSESSMENT FOR THE IDEAL INFORMATION RETRIEVAL TEST COLLECTION
H. Gilbert and K. Sparck Jones May 1979 99 p refs Sponsored in part by British Library
(BLL-BLRDR-5481)

The statistical basis of relevance assessment for information retrieval experiments is addressed with special reference to the proposed 'ideal' information retrieval test collection. Statistical arguments, or methods, for establishing what assessment information is required in given circumstances, from which actual procedures for obtaining this information may be derived are considered. The idea and specification of the 'ideal' collection is introduced along with some illustrative data on the relevance properties of various actual test collections. Some of the constraints on any proposed assessment methods and procedures are discussed. Two methods of determining assessment requirements, the 'pool' method and the 'squares' method, are developed in detail. The implications of the methods discussed are considered in terms of procedures for obtaining assessments when building the 'ideal' collection, and in relation to the use of the collection for future experiments. J.M.S.

N80-16940# British Library, London (England). Research and Development Dept.
DISSEMINATION OF NEW IDEAS IN LIBRARIANSHIP AND INFORMATION WORK
Apr. 1979 32 p Seminar held at British Library, London, 16 Oct. 1978
(BLL-BLRDR-5482; ISBN-0-905984-39-0; ISSN-0307-2385) Avail: British Library Lending Div., Boston Spa, Engl.

The dissemination of advanced developments in the field of libraries and information systems is discussed. Problems of dissemination, techniques of dissemination, and the role of national organizations are among the factors covered. Matching the technique to the target group is included. J.M.S.

N80-16941# British Library, London (England).
CAB/CAIN EVALUATION PROJECT: A COMPARATIVE STUDY ON THE PERFORMANCE OF TWO AGRICULTURAL DATABASES IN A COMPUTERIZED CURRENT AWARENESS SERVICE
Susan Harvey 1979 93 p refs
(BLL-BLRDR-5483; ISBN-90-220-0) Avail: British Library Lending Div., Boston Spa, Engl.

The selective dissemination of information performance of the Commonwealth Agricultural Bureau and the cataloging and indexing tapes of the US National Agricultural Library is compared with emphasis on the needs of a representative population of users of agricultural information. Factors which affect the overall performance of the system are identified along with the way in which they interact. These factors include the data base, search software, users-system interface, and the user. J.M.S.

N80-16942# British Library, London (England). Research and Development Dept.
SOME STATISTICAL INDICATORS OF UK ABSTRACTING AND INDEXING SERVICES
H. East Jul. 1979 34 p
(BL-BLLRDR-5488; ISBN-0-905984-40-4) Avail: British Library Lending Div., Boston Spa, Engl.

Statistical indicators relating to the size, longevity, ownership and subject scope of British abstracting and indexing services, are presented. Of the 2.9 million references published annually, 715 are in machine readable form and 629 carry abstracts. Commercial producers are currently predominant in terms of annual volumes of publication; the greatest growth is in the life sciences area. Two out of three services producers operate within a 50 mile radius of central London. M.M.M.

N80-16943# Leicester Univ. (England). Primary Communications Research Centre.
THE PRESENTATION OF SCIENCE BY THE MEDIA
Greta Jones, Ian Connell, and Jack Meadows 1979 83 p refs
(BLL-BLRDR-5494; ISBN-0-906083-04-4; ISSN-0141-0261) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The construction of media interpretations of science is studied. The sources of information available to media specialists, the use of these sources, and the way in which source material is transmuted in the course of its transmission to the general public are investigated. It is concluded that methods of approach to science are generally comparable across the media, although the nature of the medium concerned necessarily imposes its own conventions on the final mode of presentation. K.L.

N80-16944# Sheffield Univ. (England).
FORMAL DESCRIPTION, CODING AND COMPUTER HANDLING OF GENERIC FORMULAE IN CHEMICAL PATENTS
E. V. Krishnamurthy and M. F. Lynch Mar. 1979 37 p refs
(BLL-BLRDR-5490) Avail: British Library Lending Div., Boston Spa, Engl.

Some aspects of a formal linguistic approach to the automatic coding and analysis of chemical patents are discussed. Close analogy exists between the two problems of patent classification and pattern analysis. A method is outlined for developing parsing algorithms for the purpose of checking the inclusion of a specific structure or a partially defined structure as a member of the set of structures defined by a generic chemical formula occurring in chemical patents. A.R.H.

N80-16945# British Library, London (England).
AN EXPERIMENT IN SYNOPSIS PUBLISHING IN THE FIELD OF MECHANICAL ENGINEERING
R. J. Millson Sep. 1979 127 p refs
(BLL-BLRDR-5498; ISBN-0-905984-41-2; ISSN-0308-2385) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.: £10.00

In order to evaluate the concept of synopsis publishing, a subscription journal, Engineering Synopses, was published containing synopses derived from papers accepted for publication in the Proceedings of the IMechE. A regular subscription distribution of some 160 copies of the journal was achieved, augmented by about a further 150 copies distributed to questionnaire recipients, IMechE Committee members, etc. Correspondence with and visits to organizations in academia, industry and elsewhere were undertaken to augment the views of respondents to the questions and to increase the scope of the research by extending it beyond the confines of the disciplines covered by mechanical engineering. Notes are included on the cost effectiveness of the synopsis journal package compared with the traditional journal it might supplant, carrying the same number of titles; copyright implications and the launching of a synopsis journal. Reference is made to the possible future role of synopsis publishing in developing information macro-policies. Particular emphasis is placed on the needs of professional engineers in industry and a role for synopsis publishing in attempting to meet these needs. The prospects of integrating the synopsis journal with centralized on-demand services for full text provision are discussed. M.M.M.

N80-16946# Polytechnic of North London (England). School of Librarianship.
THE USE OF FORM DESIGNS FOR CATALOGUE INPUT: A PROJECT INVOLVING THE HP2645A DISPLAY STATION
S. Datta, E. J. Gredley, and P. J. Sallis Mar. 1979 67 p
(BLL-BLRDR-5501) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Research was performed to: (1) investigate the possibilities of teaching MARC cataloging to participants in the project;

(2) familiarize participants with the HP2645A terminal, exploring some of its editing facilities as a stand-alone device; and (3) investigate the value and usefulness of various form overlay designs for the input of MARC cataloging data. M.M.M.

N80-16947# British Library, London (England). Research and Development Dept.
PERSONAL CURRENT AWARENESS SERVICE: A HANDBOOK OF TECHNIQUES FOR MANUAL SDI
T. Whitehall Sep. 1979 124 p refs
(BLRDR-5502; ISBN-0-905984-43-9; ISSN-0308-2385) Avail: British Library Lending Div., Boston Spa, Engl.: £7.00; 16 BLL overseas, 15 European or 40 UK BLL photocopy coupons

Current awareness service to individuals based on scanning material collected by libraries is reported. Methods were taken from the literature and from interviews carried out in academic, special and public libraries. A wide variety of approaches to manual SDI was discovered, with librarians, subject specialists and project workers acting as scanners. Its place alongside other current awareness techniques, including computerised SDI, is discussed. There is a detailed treatment of profiling, scanning and notification techniques. A quality control system is described which is based on criteria identified by clients as being relevant to the value of an SDI service. Organization, promotion and management of SDI are also covered, and an analysis of production techniques produces four basic approaches. M.M.M.

N80-16948# British Library, London (England). Research and Development Dept.
INFORMATION SYSTEMS IN UK AGRICULTURE Final Report
G. M. Craig May 1979 85 p
(BLL-BLRDR-5469; ISBN-0-9505984-33-1; ISSN-0308-2385) Avail: British Library Lending Div. Boston Spa, Engl.: £5.00-10.00; 16 BLL overseas, 15 European or 40 UK BLL photocopy coupons

The complexity of the system(s) which exist in the UK is pointed out in order to convey the findings and applications of agricultural research to agriculturists working in different areas. Increased production and the use of certain forms of information such as review articles, seems potentially important, and new information storage and retrieval systems, utilizing modern technology, offer opportunities for improving the organization and accessibility of existing agricultural literature and data. More user education is necessary to ensure the efficient use of existing information. M.M.M.

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N80-16949# Committee on Appropriations (U. S. Senate).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, AND CERTAIN INDEPENDENT AGENCIES APPROPRIATIONS FOR FISCAL YEAR 1980, PART 1
Washington GPO 1979 1179 p refs Hearings on H.R. 4394 before a subcomm. of the Comm. on Appropriations, 96th Congr., 1st Sess., 21 Feb. 1979
(GPO-41-318) Avail: Comm. on Appropriations

Highlights of NASA's 1979 accomplishments are reviewed as a backdrop to testimony covering a space shuttle supplementary request of $185 million dollars, and a proposed 1980 budget totaling $47 billion dollars. Special emphasis is given to cost growth for space shuttle and operating plans for SEASAT, the space telescope, and the Galileo and Voyager projects. Other areas discussed include the space transportation system, space sciences, space and terrestrial applications, aeronautics and space technology, space tracking and data systems, construction of facilities, and program management. A.R.H.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation, and 44 Energy Production and Conversion.*

N80-16950* Denver Univ., Colo. Industrial Economics Div.
SPACE BENEFITS: THE SECONDARY APPLICATION OF AEROSPACE TECHNOLOGY IN OTHER SECTORS OF THE ECONOMY
Jan. 1980 236 p
(Contract NASw-3113)
(NASA-CR-162697) Avail: NASA Scientific and Technical Information Facility, P.O. Box 8757, B.W.I. Airport, Md. 21240 CSCL 05A

Over 580 examples of the beneficial use of NASA aerospace technology by public and private organizations are described to demonstrate the effects of mission-oriented programs on technological progress in the United States. General observations regarding technology transfer activitiy are presented. Benefit cases are listed in 20 categories along with pertinent information such as communication link with NASA; the DRI transfer example file number and individual case numbers associated with the technology and examples used; and the date of the latest contract with user organizations. Subject, organization, geographic, and field center indexes are included. A.R.H.

N80-16951# Rutgers - The State Univ., New Brunswick, N. J. Bureau of Engineering Research.
ULTRAFILTRATION OF RAW SEWAGE USING AN IMMOBILIZED ENZYME MEMBRANE
Shaw S. Wang, Burton Davidson, and C. Y. Jeng Jul. 1979 32 p refs
(Contract N00014-77-C-0566)
(AD-A074804) Avail: NTIS HC A03/MF A01 CSCL 13/2

Ultrafiltration of raw sewage was performed using multiple-enzymes immobilized on non-cellulosic, ultrafiltration membranes. An increase of 12% in the permeate flux rate at quasi-steady state was observed due to the action of the immobilized enzymes. Enzymes were immobilized by physical sorption to minimize the loss of ultrafiltration capability of the membrane, due to immobilization process. A mathematical model based on diffusive transport and enzymatic action was presented. A standard Marquardt algorithm and a fourth-order Runge-Kutta integration routine were used for estimation of the non-linear parameters in the model. Comparing data presented here to the data reported earlier on the ultrafiltration on NFDM (non-fat, dry milk), it was found that the enzyme-membrane has a longer half-life for the NFDM case than for the raw sewage case. Furthermore, the first-order enzyme decay rate is much faster in the multiple enzyme system used in raw sewage filtration than the single enzyme system used in the ultrafiltration of NFDM. GRA

N80-16952# Harvard Univ., Cambridge, Mass. Landscape Architecture Research Office.
THE INTERACTION BETWEEN URBANIZATION AND LAND QUALITY AND QUANTITY IN ENVIRONMENTAL PLANNING AND DESIGN: THE PUBLIC INSTITUTIONS MODEL TECHNICAL DOCUMENTATION
Avis C. Vidal and H. James Brown Mar. 1979 48 p refs
(Grant NSF ENV-72-03372)
(PB-301112/9; NSF/RA-780424) Avail: NTIS HC A03/MF A01 CSCL 13B

A model formalizing the decision processes that plan the

size and location of public institutional facilities is presented. The model is worked out in detail for the planning of public elementary and secondary schools. Demand for school facilities is estimated using the sixty household types allocated by the housing model. At the town level, this estimate of demand is used to determine whether new facilities will be built; within towns, the distribution of households is used as a guide in locating new schools. When new facilities are constructed, the associated capital expenditures are used by the fiscal model in determining each town's capital budget and tax rate. These linkages allow the modeling of school construction to be responsive to population changes. GRA

N80-16953# Harvard Univ., Cambridge, Mass. Landscape Architecture Research Office.

THE INTERACTION BETWEEN URBANIZATION AND LAND QUALITY AND QUANTITY IN ENVIRONMENTAL PLANNING AND DESIGN. THE HOUSING MODEL TECHNICAL DOCUMENTATION

Hugh Wilkins, H. James Brown, John Kirlin, Mingche Li, and Kerry Vandell May 1979 130 p refs
(Grant NSF ENV-72-03372)
(PB-301111/1; NSF/RA-780418) Avail: NTIS
HC A07/MF A01 CSCL 13B

A housing model to determine the future development pattern of residential land use is presented. The model determines the amounts and types of new residential development and locates the various housing types on particular sites on the basis of developer's profit. The model distinguishes a total of seven single-family and five multiple-family structure types for new construction. The socio-economic characteristics of households in each enumeration district are updated based on the location of new construction and housing choices made by households moving into the area. GRA

N80-16954# Otis Elevator Co., Denver, Colo. Transportation Technology Div.

VEHICLE LONGITUDINAL CONTROL AND RELIABILITY PROJECT. A REVIEW OF AGT PROPULSION, POWER CONDITIONING, BRAKING AND POWER DISTRIBUTION TECHNOLOGY, VOLUME 2, PART C Final Report

P. Schumacher, ed. Jun. 1979 78 p
(Contract DOT-UT-70048)
(PB-300373/8; OTIS/TTD/VLCR-064;
UMTA-IT-06-0148-79-2) Avail: NTIS HC A05/MF A01 CSCL 13B

The state of the art of each technology is assessed to provide top level information for system design, specification writing and regional planning. The topics discussed are: propulsion motor technology including both dc and ac motors, power conditioning options for converting guideway power to a suitable form for the motor being used, electrical and mechanical braking, and power distribution and collection considerations. GRA

N80-16955# Otis Elevator Co., Denver, Colo. Transportation Technology Div.

VEHICLE LONGITUDINAL CONTROL AND RELIABILITY PROJECT. A REVIEW OF ENTRAINMENT TECHNOLOGY Final Report

P. Schumacher, ed. Feb. 1979 92 p refs
(Contract DOT-UT-70048)
(PB-300372/0; OTIS/TTD/VLCR-059;
UMTA-IT-06-0148-79-1) Avail: NTIS HC A05/MF A01 CSCL 13B

The results of a survey of entrainment technology conducted for the VLCR project are presented. The technology review was conducted to evaluate the state-of-the-art in train formation and to identify those areas requiring special attention for Automated Guideway Transit (AGT) systems. The information which is summarized was derived through: (1) a literature search and review; (2) discussions with coupler manufacturers; (3) a questionnaire to rapid transit operators; and (4) a study of transit authority coupler specifications. GRA

N80-16956# National Technical Information Service, Springfield, Va.

A DIRECTORY OF COMPUTER SOFTWARE APPLICATIONS: SPACE TECHNOLOGY Progress Report, 1970 - Jun. 1979

Jun. 1979 142 p
(PB-296039/1; NTIS/SA-79/08) Avail: NTIS
HC $28.00/MF $28.00 CSCL 22A

Approximately 2600 space technology reports that list computer programs and/or their documentation are cited. These software applications pertain to topics such as manned spacecraft space probes, scientific satellites, and communications satellites. Satellite and spacecraft trajectories are determined and launch vehicle performance is evaluated. The directory contains complete bibliographic data for each report as well as a subject and a corporate author index. GRA

N80-16957# Oklahoma State Dept. of Health, Oklahoma City.

MUNICIPLE WASTEWATER TREATMENT BY THE OVER-LAND FLOW METHOD OF LAND APPLICATION Final Report, Jun. 1974 - Mar. 1979

Dempsey H. Hall, Joel E. Shelton, Charles H. Lawrence, Ernest D. King, and Raymond A. Mill Aug. 1979 141 p refs Prepared in cooperation with Oklahoma Univ. Health Sciences Center, Oklahoma City
(Grant EPA-R-803218)
(PB80-102908; EPA-600/2-79-178) Avail: NTIS
HC A07/MF A01 CSCL 02C

The capabilities of treating raw municipal waste water and secondarily treated waste water were assessed on a seasonal basis by applying the waste waters to experimental overland flow treatment modules. Application techniques employed in the raw treatment phase include rotating spray booms with fan nozzles. Fixed riser and trough methods were used for the secondary treatment phase. The performance of the raw waste water overland flow system and the performance of the waste water stabilization pond receiving the same waste water were compared. Tests were conducted to determine removal efficiencies for the two treatment systems and the soil composition. GRA

N80-16958# Army Engineer Waterways Experiment Station, Vicksburg, Miss.

DESIGN AND CONSTRUCTION OF COVERS FOR SOLID WASTE LANDFILLS Progress Report, Mar. 1977 - Dec. 1978

R. J. Lutton, G. L. Regan, and L. W. Jones Aug. 1979 277 p refs
(Contract EPA-IAG-D7-01097)
(PB80-100381; EPA-600/2-79-165) Avail: NTIS
HC A13/MF A01 CSCL 13B

Guidelines are provided in selection, design, and construction of cover for management of municipal, industrial, and hazardous solid wastes (with the exception of radioactive waste). Natural soils as cover are the principal subject; however, synthetic membranes, chemicals, and waste products are also discussed in detail since their relative importance should grow in the future. Each of the important functions of cover is considered in the context of selecting and designing cover but with cognizance of the effects of conflicts that may arise, e.g., between water infiltration and gas venting. A scheme is proposed for establishing functional priorities and in turn for weighting the importance of soil characteristics to allow for most effective selection. Allowance is made for functional conflicts through design features. Procedures are presented for designing soil cover systems to meet the requirements based on principles of soil mechanics and the state of the art in soil construction. Accordingly, this report is not so much a review of current methods as it is a guide to potentially the best practice. GRA

N80-16959# Celanese Chemical Co., Inc., Corpus Christi, Tex. Technical Center.

BIOLOGICAL TREATMENT OF HIGH STRENGTH PETRO-CHEMICAL WASTEWATER Final Report, 20 Feb. 1976 - 23 Sep. 1979

William J. Humphrey and Enrique R. Witt Aug. 1979 114 p
(Grant EPA-12020-EPH)
(PB80-100456; EPA-600/2-79-172) Avail: NTIS
HC A06/MF A01 CSCL 13B

The biological treatment of a complex petrochemical wastewater containing high concentrations of organic chlorides, nitrates, and amines was studied using a sequence of anaerobic methanogenesis and oxygen activated sludge. Only partial removal of chemical oxygen demand (COD) was achieved during anaerobic

denitrification because of the relatively low nitrate/COD ratio. Anerobic methanogenic treatment also was unsuccessful in reducing the COD concentration to any great extent, even after pretreatment by anaerobic denitrification. The activated sludge system was effective in removing the biodegradable portion expressed as biochemical oxygen demand of the pretreated combined wastewater stream; but the yellow color of the effluent was unacceptably dark. GRA

N80-16960# Wyle Labs., Inc., Colorado Springs, Colo. Scientific Services and Systems Group.
TRUCK DESIGN OPTIMIZATION PROJECT. PHASE 2: ANALYTICAL TOOL ASSESSMENT REPORT
L. Johnson, A. Gilchrist, M. Healy, C. Bush, and G. Sheldon Aug. 1979 58 p refs
(Contract DOT-FR-742-4277)
(PB80-104888; TDOP/TR-06; FRA/ORD-79/36) Avail: NTIS HC A04/MF A01 CSCL 13F

The performance of Type 2 freight car truck designs versus the standard, three-piece Type 1 truck was evaluated. The analytical tools, consisting primarily of freight car truck simulation models and their supporting computer programs, used to extend and interpret the field test results are described. GRA

N80-16961# Woods Hole Oceanographic Institution, Mass.
WASTEWATER RENOVATION AND RETRIEVAL ON CAPE COD
R. F. Vaccaro, P. E. Kallio, B. H. Ketchum, W. B. Kerfoot, and A. Mann Aug. 1979 193 p refs Prepared in cooperation with Massachusetts Div. of Water Pollution Control, Westborough
(Grant EPA-S-802037)
(PB80-100423; EPA-600/2-79-176) Avail: NTIS HC A09/MF A01 CSCL 02C

Alternative wastewater disposal techniques which promise to maintain high groundwater quality and promote its conservation are considered. An assessment of agricultural spray-irrigation as a potential means of lessening groundwater contamination and depletion is given. Experimental emphasis is placed on variations in the rates and methods of wastewater application and in the types of renovation agricultural crops placed under wastewater irrigation. Results from these studies are promising and suggest that under ideal circumstances, the coupling of secondary domestic effluent to animal forage crops can bring about a degree of wastewater renovation which exceeds direct disposal to sand filter beds and approaches the goals of tertiary treatments. GRA

N80-16962# Michigan State Univ., East Lansing. Inst. of Water Research.
UTILIZATION OF NATURAL ECOSYSTEMS FOR WASTEWATER RENOVATION
Thomas M. Burton, Darrell L. King, Robert C. Ball, and Thomas G. Bahr Apr. 1979 170 p refs
(Grant EPA-Y-005065)
(PB80-100431; EPA-905/3-79-003) Avail: NTIS HC A08/MF A01 CSCL 13B

A facility for the experimental treatment, recycle, and reuse of municipal sewage plant effluents is described. The facility provides for the diversion of secondary effluent from an activated sludge treatment plant. This waste flow is directed away from the receiving stream to an intensely managed aquatic and terrestrial nutrient system. Nutrients are stripped from the waste flow as it proceeds through the system incorporating nutrients into harvestable biomass. Biological activity in the aquatic system has a major impact on water quality as evidenced by significantly reduced water concentrations of phorphorus, nitrogen, and inorganic carbon. GRA

N80-16963# Kerr (Robert S.) Environmental Research Lab., Ada, Okla. Industrial Sources Section.
ACTIVATED CARBON TREATMENT OF INDUSTRIAL WASTEWATERS: SELECTED TECHNICAL PAPERS
Aug. 1979 308 p refs
(PB80-100522; EPA-600/2-79-177) Avail: NTIS HC A14/MF A01 CSCL 13B

Papers from petroleum refining/petrochemical industry symposia are presented. The topics covered are: (1) state-of-the-art; (2) organic compound removal; (3) granular pilot-scale studies; (4) powdered activated carbon pilot-scale studies; (5) full-scale granular activated carbon treatment; (6) full-scale powdered activated carbon treatment; and (7) activated carbon regeneration. The economics of activated carbon treatment are also considered. GRA

N80-16964# DeLeuw, Cather and Co., Chicago, Ill.
CHARACTERISTICS OF URBAN TRANSPORTATION SYSTEMS: A HANDBOOK FOR TRANSPORTATION PLANNERS Final Report
D. B. Sanders and T. A. Reynen Jun. 1979 196 p refs Prepared in cooperation with Urban Inst. Sponsored in part by FHWA
(Contract DOT-UT-20019)
(PB-301319/0; UMTA-IT-06-004) Avail: NTIS HC A09/MF A01 CSCL 13B

A handbook to be used by transportation planners and urban specialists for estimating system parameters for conventional transportation technology is presented. Three modes are evaluated: rail transit, local bus and bus rapid transit, and highway systems. Each mode contains an assessment of the following seven selected supply parameters: speed, capacity, operating cost, energy consumption, pollutant emissions, capital costs, and accident frequency. GRA

N80-16965# California State Div. of Mass Transportation, Sacramento.
HUMAN SERVICE AGENCY TRANSPORTATION COORDINATION Final Report
James P. Hunter Jun. 1979 101 p refs
(PB-300891/9; DMT-047; Rept-64-120-631060; UMTA-CA-09-8001-79-4) Avail: NTIS HC A06/MF A01 CSCL 13B

The costs of independent special purpose transportation services were compared with the costs of combined transportation services. The feasibility of coordinating existing transit to satisfy the transportation needs of human service agencies in various sized communities was considered. The California Department of Transportation's (Caltrans) study of the feasibility of coordinating human service agency transportation in three areas of California is presented. Cost and ridership data were collected from these agencies by means of inventories, interviews, and questionnaires. The cost data indicated that combined transportation costs are approximately equal to the average of the costs of independent special purpose transportation. GRA

N80-16966# General Accounting Office, Washington, D. C. Community and Economic Development Div.
STRONGER FEDERAL DIRECTION NEEDED TO PROMOTE BETTER USE OF PRESENT URBAN TRANSPORTATION SYSTEMS
4 Oct. 1979 71 p
(PB-300974/3; CED-79/126) Avail: NTIS HC A04/MF A01 CSCL 13B

The Federal Highway Administration and Urban Mass Transportation Administration regulations requiring urban areas to develop short-range transportation plans to make better use of present urban transportation systems are discussed. The regulations have not been as effective as they could have been because the two Federal agencies have not administered the regulations consistently, urban areas have not been able to institute planning processes that result in unified plans, and projects that have the most potential for improving the efficiency of existing transportation systems have not been widely adopted. The Secretary of Transportation needs to strengthen Federal administration of the regulations. GRA

N80-16967# Harvard Univ., Cambridge, Mass. Landscape Architecture Research Office.
THE INTERACTION BETWEEN URBANIZATION AND LAND QUALITY IN ENVIRONMENTAL PLANNING AND DESIGN: THE TRANSPORTATION MODEL TECHNICAL DOCUMENTATION
Michael Tyler and Steve Cummings May 1979 61 p refs
(Grant NSF ENV-72-03372)
(PB-300981/8; NSF/RA-780430) Avail: NTIS HC A04/MF A01 CSCL 13B

The projection of travel demand on transportation facilities is made to provide data for the evaluation of the transportation network and are linked to other models such as fiscal, air and noise. The model is composed of a travel demand and a supply or volume/performance component. The demand submodel projects travel demand between internal zones in the study area and between internal and external zones. The supply model is implemented by adding each projected origin destination pair into the network incrementally and recalculating the network equilibrium after each increment using the least time rule. In this manner, travel demand is allocated over alternative routes as a function of the level of demand. GRA

N80-16968# Harvard Univ., Cambridge, Mass. Landscape Architecture Research Office.
THE INTERACTION BETWEEN URBANIZATION AND LAND QUALITY AND QUANTITY IN ENVIRONMENTAL PLANNING AND DESIGN: THE LAND VALUE MODEL TECHNICAL DOCUMENTATION
Howard S. Bloom and H. James Brown Mar. 1979 17 p refs Color illustrations reproduced in black and white
(Grant NSF ENV-72-03372)
(PB-301047/7; NSF/RA-780434) Avail: NTIS HC A02/MF A01 CSCL 13B

A land value model to update vacant land values by hectare to account for the impact of new development is presented. These updated values provide impact both to land use models for allocations in future time periods and to the public fiscal model to provide estimates of assessed value. GRA

N80-16969# Seattle Office of Management and Budget, Wash.
OVERALL CITY TECHNOLOGY PROCESS Final Report
Arun G. Jhaveri and Casey Jones Apr. 1979 31 p
(Grant NSF ISP-78-11664)
(PB-301109/5; NSF/RA-790079) Avail: NTIS HC A03/MF A01 CSCL 13B

State-of-the-art science and technology are applied to city problems and to integrate the technology transfer process into the city's regular decision-making process. The integration of the technology assessment and application process into the city's annual budget process and the involvement of significant city staff in technology assessment, priority setting, and application activities is described. Municipal energy conservation and program performance measurement are emphasized. GRA

N80-16970# Transportation Research Board, Washington, D.C.
LOCAL AND REGIONAL DEVELOPMENT AND TRANSPORTATION NEEDS
Edward C. Muse, Robert E. Taggart, Jr., Jon E. Burkhardt, Annette M. Gaegler, and William C. Hartwig 1979 50 p refs
(PB-301207/7; TRB/TRR-716) Avail: NTIS HC A03/MF A01; HC also available from Transportation Research Board, Washington, D. C. 20418 HC $3.00 CSCL 13B

Contents: Environmental planning and design for rapid transit facilities; Estimating socioeconomic impacts of transportation systems; Residential dislocation costs and consequences; Dynamic social and economic effects of the Connecticut Turnpike; Rural road-closure planning program to preserve agricultural land; New location patterns and U.S. transportation policy; Development of truck trip-generation rates by generalized land-use categories. GRA

N80-16971# Hensley-Schmidt, Inc., Jackson, Miss.
TRANSPORTATION NEEDS FOR THE ELDERLY, HANDICAPPED AND LOW INCOME OF MISSISSIPPI
Kay Van Sickel and Kenneth W. Heathington 1979 33 p Sponsored in part by Mississippi State Highway Dept., Jackson., and Mississippi Council on Aging
(PB-301273/9) Avail: NTIS HC A03/MF A01 CSCL 13B

The present role of public transportation in Mississippi and future alternative directions are outlined. An inventory of special transportation services and analysis of transportation demands and vehicle needs along with alternatives for coordination of these services are included. A manual of Federal programs that provide funds for transportation services, both rural and urban, was compiled to aid transportation agencies and communities in Mississippi in developing comprehensive, balanced transportation programs. GRA

N80-16972# Young (Arthur) and Co., Washington, D. C.
INFORMATION TRANSFER IN THE OFFICE OF RESEARCH AND DEVELOPMENT Final Report
Steven Stryker, Hugo Becker, and Angela Griffiths Aug. 1979 46 p
(PB80-101371; EPA-600/9-79-030) Avail: NTIS HC A03/MF A01 CSCL 05B

The results of a study conducted to determine the effectiveness of the Office of Research and Development's (ORD) information transfer activities are presented. The type and volume of activity is reported as well as costs, intended and actual audiences, and the method used for determining each activity's public demand. Activities include journal articles, speeches, conferences and seminars, technical reports, and newsletters. GRA

N80-16973# Colorado Univ. at Boulder.
TREATMENT OF SECONDARY EFFLUENT BY INFILTRATION-PERCOLATION Final Report, Aug. 1975 - Sep. 1978
D. G. Smith, K. D. Linstedt, and E. R. Bennett Aug. 1979 118 p refs Prepared in cooperation with City of Blouder, Colo.
(Grant EPA-R-803931)
(PB80-103658; EPA-600/2-79-174) Avail: NTIS HC A06/MF A01 CSCL 13B

The treatment performance of three rapid infiltration basins receiving secondary treated municipal waste water is evaluated at the City of Boulder Sewage Treatment Plant. The pretreatment, the hydraulic load to the soil, the duration wetting and drying cycles, and climatic influences on system performance are evaluated. Two of the basins have unscarified beds while one has a bed surface constructed in a ridge and furrow arrangement. Year-round operation allowed evaluation of applied effluent and infiltrated water collected from underdrains during extreme climatic conditions. GRA

N80-16974# DeLeuw, Cather and Co., Chicago, Ill.
AGT GUIDEWAY AND STATION TECHNOLOGY. VOLUME 8: WEATHER PROTECTION CONCEPTS Final Report
R. D. Stevens, T. J. Nicario, T. J. McGean, S. M. Easley, and T. L. Easley Aug. 1979 249 p refs Prepared jointly with ABAM Engineers Inc.
(Contract DOT-UT-70066)
(PB-299746/8; UMTA-IT-06-0152-79-7) Avail: NTIS HC A11/MF A01 CSCL 13F

Guideway, station, and weather protection concepts which will reduce the cost and implementation time associated with AGT systems as well as to improve performance are considered. Weather protection concepts are presented for guideways associated with AGT systems, with emphasis on minimizing costs and energy consumption while maximizing system operability/reliability during winter weather. The concepts include a comparison of embedded pipe and electric heating systems with varied heated widths, heating densities, and amount of utilization. GRA

N80-16975# Comsis Corp., Wheaton, Md.
TRANSIT CORRIDOR ANALYSIS: A MANUAL SKETCH PLANNING TECHNIQUE Final Report
M. M. Carter, R. H. Watkins, J. D. ODoherty, M. Iwabuchi, and G. W. Schultz Apr. 1979 207 p Prepared for Urban Mass Transportation Admin. Prepared in cooperation with DeLeuw, Cather and Co., Washington, D.C., Voorhees (Alan M.) and Assoc., Inc., McLean, Va., and Pratt (R. H.) Assoc., Inc., Washington, D.C.
(PB-301378/6; UMTA-MD-06-0046-79-1) Avail: NTIS HC A10/MF A01 CSCL 13B

A sketch planning technique for quick first evaluations of urban transportation planning proposals is described. General parameters and assumptions are discussed and those situations in which the technique can be applied are identified. The method and computation procedures are presented along with examples of each step of the procedures as applied to a sample problem. GRA

N80-16976# National Technical Information Service, Springfield, Va.
ELECTRIC AUTOMOBILES. CITATIONS FROM THE NTIS

DATA BASE Progress Report, 1964 - Aug. 1979
Audrey S. Hundemann Sep. 1979 276 p Supersedes NTIS/PS-78/0880, NTIS/PS-77/0835, NTIS/PS-76/0560 and NTIS/PS-75/490
(NTIS/PS-79/0990/6; NTIS/PS-78/0880; NTIS/PS-77/0635; NTIS/PS-76/0560; NTIS/PS-75/490) Avail: NTIS HC $28.00/MF $28.00 CSCL 13F

The research pertaining to battery systems, costs, and evaluations of electric vehicles are presented. Nickel zinc and lead acid batteries are studied and various types of lithium cells and hybrid heat engine/electric systems are reported. This bibliography contains 271 abstracts, 58 of which are new entries to the previous edition. GRA

N80-16977*j* National Technical Information Service, Springfield, Va.
ELECTRIC AUTOMOBILES, VOLUME 2. CITATIONS FROM THE ENGINEERING INDEX DATA BASE Progress Report, 1975 - Aug. 1979
Audrey S. Hundemann Sep. 1979 285 p Supersedes NTIS/PS-78/0881; NTIS/PS-77/0637; and NTIS/PS-76/0561
(NTIS/PS-79/0991/4; NTIS/PS-78/0881; NTIS/PS-77/0637; NTIS/PS-76/0561) Avail: NTIS HC $28.00/MF $28.00 CSCL 13F

Citations from worldwide research cover the design of electric automobiles, vans, buses, and hybrid vehicles. Studies are included on lead-acid, zinc-air, lithium-sulfur, and nickel-cadmium batteries; fuel cells; drive trains; and chassis construction. This updated bibliography contains 279 abstracts, 75 of which are new entries to the previous edition. GRA

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N80-16978 Texas Univ. at Austin.
INTERIOR REISSNER-NORDSTROM BLACK HOLES Ph.D. Thesis
Nelson Arturo ZamoranoHole 1979 130 p
Avail: Univ. Microfilms Order No. 7928372

A scalar wave packet localized at the event horizon, and considered as a small disturbance is able to send waves that after a double scattering sneak into the Cauchy horizon producing unbounded energy densities there. This is a direct consequence of the analytic structure of the reflection and transmission coefficients. It is concluded that the inner horizon is generally unstable in nature. In the Reissner-Nordstrom case, the inclusion of the observed universal microwave radiation is sufficient to produce a great change of the R-N topology at the Cauchy horizon. In dealing with the dynamics of the massless scalar waves in this geometry the radial part of the equations arising by perturbations of a family of black holes (Schwarzschild, Reissner-Nordstrom and Kerr) is a form of the spin-weighted spheroidal wave equation. In other words, the angular part and the radial part of scalar perturbations of the black holes mentioned above obey the same equation. Dissert. Abstr.

N80-16979 Tufts Univ., Medford, Mass.
RADIO ASTRONOMICAL OBSERVATIONS OF REGIONS OF STAR FORMATION Ph.D. Thesis
Robert Frederick Wilson 1979 292 p
Avail: Univ. Microfilms Order No. 7920529

The observations of radio wavelength atomic and molecular transitions towards regions of star formation are presented. Radio wavelength measurements and upper limits for CH emission from diffuse interstellar clouds in the direction of nearby bright stars whose optical wavelength spectra exhibit the absorption lines of CH are reported. Line emission from OH and NH3 was detected in the direction of small groups of T Tauri stars and the space between them. Impact broadening was detected in the radio frequency recombination lines emitted by the emission nebular W51 (G49.5 + 0.0) and W49A (G49.2 + 0.0). The search for OH maser emission in the direction of more than eighty infrared stars is discussed along with the detection of twelve new sources of emission. Dissert. Abstr.

N80-16980 California Univ., Los Angeles.
SPECTROPHOTOMETRY OF RING NEBULAE AROUND WOLF-RAYET STARS Ph.D. Thesis
Karen Beth Kwitter 1979 179 p
Avail: Univ. Microfilms Order No. 8001381

Spectrophotometric observations of four ring nebulae surrounding population I Wolf-Rayet stars and four additional filamentary nebulae are analyzed in order to determine the physical conditions and chemical abundances in these objects. It is concluded that the ring nebuale are enriched in nitrogen and helium as a result of contamination of the ambient interstellar medium by the helium- and nitrogen-rich wind from the central Wolf-Rayet star. Two of the additional nebulae are found to be Peimbert Type I planetary nebulae, overabundant in nitrogen and helium due to mixing of CNO processed material into the parent envelope prior to ejection. Two of the remaining objects, a shell around an Oef star and a small H II region around an early Be star, exhibit normal abundances. For two of the ring nebulae, the fraction of nebular mass contributed by the central star from published stellar abundances is estimated. It is found that in these cases, the stellar wind has provided less than 10% of the observed nebular mass. Dissert. Abstr.

N80-16981 California Univ., Berkeley.
LONG TERM VARIATION OF ASTEROID NUTATION Ph.D. Thesis
Richard Paul Henke 1979 115 p
Avail: Univ. Microfilms Order No. 8000375

Asteroids are irregular bodies that are shown to be rotating by the variation in the reflected solar illumination as they rotate. Since they are irregular, the character of their rotational motion is described by specifying the time dependence of the components of their angular velocities along the eigenvectors of their nondegenerate inertia tensors. The results presented are the computation of (1) the time scale for the decay of the residual energy, (2) the rate of the residual energy excitation, and (3) the equilibrium value of the residual energy as function of the asteroid's physical and dynamic parameters and an adopted field asteroid mass and velocity distribution. The amount of nutation is interpreted in terms of its impact on the light curves of the asteroids, which are assumed to be triaxial ellipsoids.
Dissert. Abstr.

N80-16982 California Univ., Berkeley.
EUV OBSERVATIONS OF THE LOCAL ISM Ph.D. Thesis
Jay Reynolds Freeman 1979 174 p
Avail: Univ. Microfilms Order No. 8000346

The design, calibration, operation, and data analysis of two spaceborne extreme-ultraviolet photometers, sensitive at the 584 A spectral line of neutral helium, are described. Analysis of data from the first instrument indicates that to two standard deviations, the bulk speed of the local interstellar medium with respect to the Sun exceeds 15 km/s. Data from the second instrument provides a measurement of the number density of neutral helium in the nearby interstellar medium which is smaller than values derived by cruder measurements by a factor of almost three. When this value of the helium number density is interpreted in the context of theoretical models of the interstellar medium, it is concluded that the temperature of the local interstellar radiation field is less than or about equal to 7000 K and that the solar system may lie within the outskirts of an interstellar gas cloud. Dissert. Abstr.

N80-16983 Texas Univ. at Austin.
AN INVESTIGATION OF THE PROPERTIES OF CLOSE MULTIPLE STARS Ph.D. Thesis

Francis Charles Fekel, Jr. 1979 285 p
Avail: Univ. Microfilms Order No. 7928284

Over 350 high dispersion coude plates and coude Reticon observations of 15 close multiple systems were obtained and measured for radial velocities to determine spectroscopic orbital elements. Multiplicity was discovered or confirmed for six of these systems and nine others were reinvestigated. Use of the solid state Reticon detector produced observations with very high signal-to-noise. As a result, seven spectroscopic components not previously seen with conventional detectors were discovered in these systems. The properties of these 15 systems and 22 others from the literature were compared with the results of numerical studies of the formation of close multiple stars by both fission and fragmentation. The ages of solar type close multiple systems were estimated from lithium abundances of the individual components. The determination of the masses of late type giants is discussed. The masses of two more late type giants were determined using spectroscopic, occultation, speckle, and visual observations. Dissert. Abstr.

N80-16984 Virginia Univ., Charlottesville.
A RADIO SURVEY OF BRIGHT GALAXIES Ph.D. Thesis
Linda Lou Dressel 1979 223 p
Avail: Univ. Microfilms Order No. 8002517

A radio continuum survey of a large apparent magnitude limited sample of galaxies to determine which galactic properties and environments are associated with the occurrence of radio sources is reported. The 2380 MHz system was used to observe all 2095 galaxies in the Uppsala General Catalog of Galaxies brighter than m sub p = 14.5. Twenty two percent of the sources were above the detection limit of 15 mJy. A three element interferometer was used to find flux densities, spectral indices, and positions of dominant compact components in sources stronger than 35 mJy. Dissert. Abstr.

N80-16985 California Inst. of Tech., Pasadena.
A STUDY OF HYDROXYL MASERS IN THE CIRCUMSTELLAR ENVELOPES OF LONG PERIOD VARIABLE STARS Ph.D. Thesis
Menachem Cimerman 1980 91 p
Avail: Univ. Microfilms Order No. 8000956

The problem of the OH mainline masers is investigated by radio observations of two LPV sources with unique OH properties, and by a theoretical analysis. Observations of the OH maser in W Hya are presented, which suggest an explanation of their unique polarization characteristics. The maser lines may be formed at a distance of approximately 1 x 10 to the 14th cm from the stellar surface in the presence of a magnetic field of approximately 1 x 10 to the 9th milligauss. The pumping of OH masers in late type variables by direct stellar radiation of 2.8 microns is studied. Two pumping schemes are suggested based on line coincidences between OH V=0-1 transitions and strong H2O upsilon 3 transitions. The water molecules perturb the stellar radiation by absorption, and thus cool the coinciding OH transition. It is demonstrated that this cooling is capable of producing strong OH masers in the circumstellar envelopes of late type variables. Dissert. Abstr.

N80-16986*# Northwestern Univ., Evanston, Ill. Dept. of Physics and Astronomy.
HELIUM RUNAWAYS IN WHITE DWARFS
Ronald E. Taam 8 Aug. 1979 22 p refs
(NASA-CR-162694) Avail: NTIS HC A02/MF A01 CSCL 03A

The long term evolution of an accreting carbon white dwarf was studied from the onset of accretion to the ignition of helium. The variations in the details of the helium shell flash examined with respect to variations in mass accretion rate. For intermediate rates the helium flash is potentially explosive whereas for high rates the shell flash is relatively weak. The results are discussed in the context of the long term evolution of novae. A.R.H.

N80-16987*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CHARACTERISTICS OF THE TELESCOPE FOR HIGH ENERGY GAMMA-RAY ASTRONOMY SELECTED FOR DEFINITION STUDIES ON THE GAMMA RAY OBSERVATORY
E. B. Hughes (Stanford Univ., Calif.), R. Hofstadter (Stanford Univ., Calif.), A. Johansson (Stanford Univ., Calif.), J. Rolfe (Stanford Univ., Calif.), D. L. Bertsch, W. J. Cruickshank, C. H. Ehrmann, C. E. Fichtel, R. C. Hartman, D. A. Kniffen et al Oct. 1979 26 p refs Presented at IEEE 1979 Sci. Symp., San Francisco, 17-19 Oct. 1979 Submitted for publication
(Contract NAS5-25544; Grant NGR-05-020-452)
(NASA-TM-80590) Avail: NTIS HC A03/MF A01 CSCL 03A

The high energy gamma-ray selected for definition studies on the Gamma Ray Observatory provides a substantial improvement in observational capability over earlier instruments. It will have about 20 times more sensitivity, cover a much broader energy range, have considerably better energy resolution and provide a significantly improved angular resolution. The design and performance are described. Author

N80-16988*# National Aeronautics and Space Administration, Washington, D. C.
UBVR OBSERVATION OF V1357 CYG = CYG X-1. SEARCH OF THE OPTICAL RADIATION OF THE ACCRETION DISK
V. S. Shevchenko Nov. 1979 20 p refs Transl. into ENGLISH of "UBVR Nablyudeniya V 1387 Cyg = Cyg X-1. Poisk Opticheskogo Izlucheniya akkretsionnogo Diska," Rept. Pr-408 Acad. of Sci. USSR, Inst. of Space Res., Moscow, 1978 p 1-22 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75677; Pr-408) Avail: NTIS HC A02/MF A01 CSCL 03A

Data from 30 nights of V 1357 Cyg observations in July, August, and September of 1977 are presented. The contribution of the disk to the optic brightness of the system is computed with regard for the heating of its surface by ultraviolet radiation from V 1357 Cyg and X-ray radiation from Cyg X-1. The disk radiation explains the irregular variability in the system brightness. The possibility of the eclipse of the star by the disk and the disk by the star is discussed. K.L.

N80-16989*# Harvard Coll. Observatory, Cambridge, Mass.
X-RAY OBSERVATIONS OF A COMPACT BINARY SOURCE Final Report, 1 Jul. - 31 Dec. 1979
A. K. Dupree 1979 6 p refs
(Grant NsG-5312)
(NASA-CR-162750) Avail: NTIS HC A02/MF A01 CSCL 03A

Simultaneous X-ray and ultraviolet measurements of selected binary X-ray sources can provide a unique probe of the wind structure and mass loss phenomena in an extended stellar atmosphere. Measurements of the X-ray flux from Vela X-1 (HC8 77581) and 4U1700-37 (HD153919) obtained by OAO 3 and IUE are discussed. A.R.H.

N80-16990# National Technical Information Service, Springfield, Va.
A DIRECTORY OF COMPUTER SOFTWARE APPLICATIONS: ASTRONOMY AND ASTROPHYSICS Progress Report, 1970 - May 1979
May 1979 36 p
(PB-294832/1; NTIS/SA-79/07) Avail: NTIS HC $25.00/MF $25.00 CSCL 03B

Approximately 430 astronomy and astrophysics reports that list computer programs and/or their documentation are cited. These software applications pertain to topics such as solar activity, atmospheric radiative transfer, stellar and galactic structure, lunar and planetary studies, and astrophysical data reduction. GRA

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N80-16991 California Univ., Berkeley.
RELATIVE ISOTOPIC ABUNDANCES OF ZIRCONIUM IN S-TYPE STARS Ph.D. Thesis
Alma Claire Zook 1978 82 p
Avail: Univ. Microfilms Order No. 8000589

The relative abundances of the six stable or nearly stable isotopes of zirconium were measured for three S stars, R Cyg, V Cnc, and R Gem. The method of analysis is described with the abundances determined by comparing the observed stellar profile of intensity vs wavelength with synthetic spectra calculated by the Minnaert interpolation scheme for a single slab LTE stellar atmosphere. The presence of the long lived unstable isotope Zr-93 supports the hypothesis that nucleo-synthesis is taking place in the S stars, while the absence of the r-process isotope Zr-96 supports the hypothesis that the s process is the mechanism responsible for this nucleosynthesis. Dissert. Abstr.

N80-16992 California Univ., Berkeley.
HETERODYNE SPATIAL INTERFEROMETRY OF CIRCUMSTELLAR DUST SHELLS AT A WAVELENGTH OF 11 MICRONS Ph.D. Thesis
Edmund Charles Sutton 1979 179 p
Avail: Univ. Microfilms Order No. 8000532

The spatial distribution of the 11 micron thermal emission from circumstellar dust envelopes was studied using an infrared heterodyne interferometer. The spatial distribution of silicate grain emission was measured to probe the temperatures and densities of the circumstellar material and thereby to gain an understanding of the structures of circumstellar envelopes. The interferometer used consists of two separate telescopes, each of which is associated with a heterodyne receiver. Among the sources which were observed with this interferometer are alpha Orionis, o Ceti, VY Canis Majoris, and IRC +10216. The 11 micron brightness distributions of these objects all have spatially extended dust emission components. Other significant observations and results are reported. Dissert. Abstr.

N80-16993 Maryland Univ., College Park.
KINEMATICS OF H1 NEAR THE GALACTIC CENTER Ph.D. Thesis
Rameshwar Prasad Sinha 1979 162 p
Avail: Univ. Microfilms Order No. 8002062

The results of a survey of 21 cm line emission in Milky Way Galaxy from 360 deg to 11 deg longitude and from -2 deg to +2 deg latitude are presented. These data along with other published data are used in the derivation of a rotation curve for the Galaxy inside the solar circle (radius 10 kpc). The rotation curve is used to derive a mass model consisting of three components, viz., a nuclear spheroid, a spherical bulge, and a general galactic disk. The symmetry properties of the distribution of H1 in the region around the galactic center are explored. Inside a radius of 1 kpc the H1 appears to be distributed in the shape of an elongated noncircular slowly rotating disk which is inclined to the galactic equator. The velocity dispersion of the H1 distribution in the central elongated disk is examined. Dissert. Abstr.

N80-16994 California Univ., Santa Cruz.
MASS LOSS FROM CATACLYSMIC VARIABLE SECONDARIES Ph.D. Thesis
Ronald Lynn Gilliland 1979 72 p
Avail: Univ. Microfilms Order No. 8002209

Computer simulations of mass loss from cataclysmic variable star secondaries are discussed. The calculations involve solution of the nonlinear hydrodynamical equations of stellar structure under varying degrees of approximation in an attempt to determine stability of the mass loss process. Evolutionary sequences treating only the region near the Lagrangian point were constructed in a manner consistent with the assumption of Roche geometry. The effects of mass flow nonorthogonal to the Roche equipotential surfaces were examined. Dissert. Abstr.

N80-16995 California Univ., Santa Cruz.
H 2 REGION-LIKE GALAXIES Ph.D. Thesis
Howard Bradley French 1979 77 p
Avail: Univ. Microfilms Order No. 8002208

Line fluxes in the region 3700 - 7100A are presented for 14 galaxies with strong, sharp, H 2 region like emission lines. Ratios of the line fluxes are used to derive electron temperatures and densities, and the abundances of helium, oxygen, nitrogen, neon and sulfur relative to hydrogen. The galaxies are found to be photoionized by hot main sequence stars. The velocity dispersion was measured for one object; the mass of stars derived for it was several times smaller than the mass of neutral hydrogen which was previously found in an extened halo around this object. Galactic chemical evolution was investigated through a comparison of the relative abundances in these galaxies with their normal values. Dissert. Abstr.

N80-16996 Iowa State Univ. of Science and Technology, Ames.
TREATMENT OF MOLECULAR ABSORPTION BY USE OF TRANSMISSION AVERAGE OPACITIES IN COOL STELLAR ATMOSPHERE MODELS Ph.D. Thesis
Frederick Bender 1979 298 p
Avail: Univ. Microfilms Order No. 8000114

Computation of cool stellar atmosphere models by means of transmission averages was examined. Models were computed using the transmission average to represent the opacity of the CO molecule. The use of the models in conjunction with a synthetic spectrum generator is discussed. Dissert. Abstr.

N80-16997*# Harvard Coll. Observatory, Cambridge, Mass.
STUDIES OF THE LOCAL INTERSTELLAR MEDIUM Final Report, 1 May - 30 Sep. 1979
A. K. Dupree 1979 13 p refs
(Grant NsG-5293)
(NASA-CR-162749) Avail: NTIS HC A02/MF A01 CSCL 03B

The existing ultraviolet and optical data concerning late-type stars are discussed along with the acquisition and reduction of additional ultraviolet and simultaneous ground-based observation. The stars Alpha Centauri A, and Lamdba Andromedia are discussed in terms of stellar chromospheres, or the instellar medium. F.O.S.

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N80-16998* National Aeronautics and Space Administration, Washington, D. C.
ATLAS OF MARS: THE 1:5000000 MAP SERIES
R. M. Batson, P. M. Bridges, and J. L. Inge 1979 154 p refs Prepared in cooperation with Geol. Surv., Flagstaff, Ariz. (NASA Order W-13709; NASA Order WO-8122; NASA Order W-13687; NASA Order L-55232)
(NASA-SP-438; LC-79-600164) Avail: SOD HC $7.00 as NAS1.21:438 CSCL 03B

Small-scale maps and photomosaics covering the entire surface of the planet Mars are presented. The cartographic contents are reduced-scale versions of the 1:5,000,000 topographic series of 30 quadrangles compiled by the U.S. Geological Survey in cooperation with NASA. Most of the quadrangles were compiled with data from the Mariner 9 spacecraft, gathered in 1972. A few sheets, however, incorporated information derived from the two Viking Orbiter spacecraft from 1976 through 1978. Several versions of each quadrangle are shown. These versions include the controlled photomosaics from which final map products were derived, airbrushed shaded relief maps based on the photomosaics and on a variety of special computer enhancements of pictures not included in the mosaics, shaded relief maps with overprints of albedo markings derived by special enhancements of selected Mariner 9 images and contour maps derived from a wide variety of nonimage data ranging from Earth-based radar to remote sensing instruments on the Mariner 9 spacecraft. Discussions of mapping procedures and a gazeteer of feature nomenclature on Mars are included in appendices. A.R.H.

N80-16999 California Univ., Los Angeles.
LUNAR MAGNETISM AND PLASMA INTERACTIONS Ph.D. Thesis
Howard Weiss 1979 103 p

Avail: Univ. Microfilms Order No. 8001418

The nature and origin of distinct magnetic signatures observed from lunar orbit are examined. A comparison of the dayside lunar magnetic measurements of the Apollo subsatellites with simultaneous interplanetary measurements reveals an enhancement of the lunar compressional fluctuations when the lunar measurements were taken below 100 km altitude. The most probable source of these low altitude fluctuations appears to be the interaction of the solar wind with anomalous magnetic fields on the moon's surface. The possibility of cratering of the lunar surface as the source of both the anomalous magnetic fields and weak dipole field of the moon is explored. It is found that the present upper limit of a lunar dipole moment can be approximated by the cratered shell model if the 17 largest lunar craters and a reasonable level of magnetization of the crust are used. Nevertheless, it appears that the anomalous magnetic fields presently observed on the lunar surface are not directly a consequence of cratering of an internally magnetized crust. Dissert. Abstr.

N80-17000 California Univ., Berkeley.
NOBLE-GAS-RICH SEPARATES FROM ORDINARY CHONDRITES Ph.D. Thesis
Robert Keith Moniot 1979 75 p
Avail: Univ. Microfilms Order No. 8000447

Acid resistant residues were prepared by HCl-HF demineralization of three H-type ordinary chondrites. These residues were found to contain a large proportion of the planetary type trapped Ar, Kr, and Xe of the meteorites. The similarity of these acid residues to those from carbonaceous chondrites and LL type ordinary chondrites suggests that the same phase carries the trapped noble gases in all these diverse meteorite types. Because the H group represents a large fraction of all meteorites, this result indicates that the gas rich carrier phase is as universal as the trapped noble-gas component itself. Dissert. Abstr.

N80-17001*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NARROW-BAND JOVIAN KILOMETRIC RADIATION: A NEW RADIO COMPONENT
Michael L. Kaiser and M. D. Desch Jan. 1980 16 p refs Submitted for publication
(NASA-TM-80626) Avail: NTIS HC A02/MF A01 CSCL 03B

A new component of Jupiter's radio spectrum is investigated. The component emits in a very narrow bandwidth (less than or equal to 40 kHz) near 100 kHz. Its waveform is a very smooth and gradual rise and subsequent fall in intensity, usually over two hours. The emission is polarized with left hand polarization associated with the Jovian northern magnetic hemisphere and right hand with the south. The emissions deviation from a strict system 3 rotation period repetition rate is examined. The emission source of the narrow band component which rotates 3 to 5 percent slower than all other forms of Jovian radio emission is determined from propagation considerations, coupled with the observed lack of corotation, to a source region near the equatorial plane at the outer edge of the Io plasma torus. The narrow band KOM (nKOM) form is examined using observations from the PRA instrument. The spectrum and occurrence statistics are described and contrasted with the tapered or broadband KOM (bKOM) characteristics. A.W.H.

N80-17002*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE OCCURENCE RATE, POLARIZATION CHARACTER AND INTENSITY OF BROADBAND JOVIAN KILOMETRIC RADIATION
M. D. Desch and M. L. Kaiser Jan. 1980 26 p refs Submitted for publication
(NASA-TM-80627) Avail: NTIS HC A03/MF A01 CSCL 03B

The major observational features of one new component of Jupiter's radio emission spectrum, the broadband kilometer-wavelenth radiation or bKOM are described. The Voyager planetary radio astronomy experiments reveal that the overall occurrence morphology, total power, and polarization character of bKOM are strong functions of the latitude and/or local time geometry of the observations. The post-encounter data show a decline in the mean occurrence rates and power level of bKOM and, in particular, a depletion in the occurrence rate at those same longitudes where the detection rate is a maximum before encounter. Additionally, the polarization sense undergoes a permanent reversal in sign after encounter, whereas the time-averaged wave axial ratio and degrees of polarization remain relatively unchanged. No evidence of any control by Io is found. The strong dependence of the morphology on local time suggests a source whose beam is nearly fixed relative to the Jupiter-sun line. A.R.H.

N80-17003*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
VOYAGER 1: ENCOUNTER WITH JUPITER
Mar. 1979 44 p Original contains color illustrations
(NASA-CR-162721; JPL-400-11) Avail: NTIS HC A03/MF A01 CSCL 03B

An overview of the Voyager is presented along with samples of the nearly 19,000 photographs returned by Voyager 1 spacecraft at the midpoint of its 38-month mission to Jupiter and Saturn. Particular emphasis is given to color photographs of the Great Red Spot, and the surface features of the Galilean satellites. A.R.H.

N80-17004*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE STRATIGRAPHIC SEQUENCE OF VOLCANIC AND SEDIMENTARY UNITS IN THE NORTH POLAR REGION OF MARS
Michael E. Botts Jan. 1980 69 p refs
(NASA-TM-78254) Avail: NTIS HC A04/MF A01 CSCL 03B

Based on photogeologic mapping of Viking orbiter images of Mars, four distinct informal stratigraphic units are defined for the region north of 70 degrees N latitude. They are: (a) bulbous plains, (b) mantled plains, (c) dune deposits, and (d) layered deposits/perennial ice. Background information on the Martian polar caps is provided from telescopic observation, Mariner mission results, and Viking mission results (August 1976-November 1978). A description, and an interpretation and distribution of the stratigraphic units are presented. Surface winds, which were determined from dune orientations, and discussed and implications for the source of circumpolar dune materials are delineated. A list of the Viking Orbiter imagery used in the research, the computer programs for crater size frequency distributions, and the crater size frequency data are presented. A.W.H.

N80-17005*# Cornell Univ., Ithaca, N. Y. Center for Radiophysics and Space Research.
ANALYSIS OF EROSION AND TRANSPORTATION FEATURES FROM LUNAR ORBITER AND APOLLO PHOTOGRAPHY Final Technical Report, 15 Jun. 1977 - 31 Jul. 1978
Thomas Gold 1980 11 p
(Grant NsG-7348)
(NASA-CR-162703) Avail: NTIS HC A02/MF A01 CSCL 03B

Certain classes of surface features in Lunar Orbiter and Apollo Panoramic Photographs are identifed and possible correlations between the occurrence of these features and their geographical location on the Moon are studied. Whether evidence of erosion and transport processes not encountered on Earth exists is investigated using the lunar photographs. The variety and intensity of transport processes on the Moon resulting from exposure to plasmas is discussed. A.W.H.

N80-17006*# National Aeronautics and Space Administration, Washington, D. C.
THE STRUCTURE AND MICROPHYSICAL PROPERTIES OF THE CLOUDS OF VENUS
M. Ya. Marov Aug. 1979 64 p refs Transl. into ENGLISH of "Struktura i Mikrofizicheskiye Svoistva Oblakov Venery", Preprint-144 Acad. of Sci. USSR, Inst. of Applied Mathematics, Moscow, 1978 p 1-69 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(NASw-3199)
(NASA-TM-75725; Preprint-144) Avail: NTIS HC A04/MF A01 CSCL 03B

Results are presented from the processing and interpreta-

tion of measurement data in the descent capsules of the automatic stations Venera-9 and Venera-10 for the characteristics of light scattering in the atmosphere of Venus by means of onboard nephelometers. A model for the aerosol component in the planet's atmosphere in the altitude range 62-14 km is proposed. Author

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N80-17007*# National Aeronautics and Space Administration, Washington, D. C.
THE MECHANISM OF TEMPERATURE AND PRESSURE CHANGES IN THE EARTH'S ATMOSPHERE DURING SOLAR FLARES
V. D. Reshetov Jun. 1979 11 p refs Transl. into ENGLISH of conf. paper "O Mekhanizme Izmenenia Temperatury i Davlenia v Atmosfere Zemli pri solnechnykh Vspyshkakh", 1974 p 288-296 Presented at 1st All-Union Conf. on Sun Atmosphere Relations in Climate Theory and Weather Forecasts, Moscow, 30 Oct. - 1 Nov. 1972 p 288-296 Original language document was announced as A74-37725 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-75349) Avail: NTIS HC A02/MF A01 CSCL 03B

The effect of solar flares on the weather on Earth is examined. It is concluded that the processes which arise in the atmosphere are so intricate that a single calculation of solar activity is insufficient for long-range forecasting. However, combined consideration of processes dependent upon the dynamic instability of the atmosphere and the effect of solar activity will contribute to the improvement of long-range forecasts. A.R.H.

N80-17008# Massachusetts Inst. of Tech., Cambridge. Center for Space Research.
ANALYSIS OF SOLAR WIND DATA FROM THE SOLRAD 11A AND 11B SPACECRAFT Final Report, 1 Feb. 1975 - 31 May 1978
Alan J. Lazarus Hanscom AFB, Mass. AFGL Feb. 1979 88 p refs
(Contract F19628-75-C-0131; AF Proj. 2311)
(AD-A070945; AFGL-TR-79-0056) Avail: NTIS HC A05/MF A01 CSCL 03/2

The data reduction, analysis, and interpretation of solar wind data obtained from the experiment on the SOLRAD spacecraft are described. This experiment which involved plasma detectors that measure current within differential energy channels for positive ions and electrons is reviewed. The positive ion distribution functions determined from the SOLRAD data are analyzed. A.W.H.

N80-17009# Tufts Univ., Medford, Mass. Dept. of Physics.
VERY LARGE ARRAY (VLA) OBSERVATIONS OF SOLAR ACTIVE REGIONS
Kenneth R. Lang 1 Feb. 1979 19 p refs
(Contract F19628-79-C-0010)
(AD-A066780; AFGL-TR-79-0037; SR-1) Avail: NTIS HC A02/MF A01 CSCL 03/2

Synthesis maps of solar active regions obtained using twelve 25 m paraboloids (65 interferometer pairs) of the very large array (V.L.A.) are presented and described. A synthesized beam of 1 in by 3 in is obtained at a wavelength of 6 cm. The present and future observational capabilities of the V.L.A. are described and the basic techniques of using the V.L.A. to observe the Sun are described. A.W.H.

N80-17010# National Oceanic and Atmospheric Administration, Boulder, Colo.
ENERGY RELEASE IN SOLAR FLARES. PROCEEDINGS OF THE WORKSHOP ON ENERGY RELEASE IN FLARES
David M. Rust and A. Gordon Emslie Jul. 1979 73 p refs Workshop held at Cambridge, Mass. 26 Feb. - Mar. 1979 Prepared in cooperation with Am. Sci. Eng., Inc., Cambridge, Mass. and Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass. (PB-300905/7; UAG-72; NOAA-79081307) Avail: NTIS HC A04/MF A01 CSCL 03B

Parallel meetings of three small teams were held where theories of thermalization, particle acceleration, and mass motion in flares were discussed. An overview of the major scientific issues identified for the study of energy release in flares is given. More specific discussions of the three program areas are included. The concepts of Joint Observing Sequences and Collaborative Observing Sequences (COSs) developed by NASA's Solar Maximum Mission investigators are explained. Specific observations needed for each COS are listed. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N80-17011*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.
ENERGY SPECTRA OF COSMIC RAY NUCLEI TO ABOVE 100 GeV/NUCLEON
M. Simon (Max Planck Inst. fuer Extraterrestriche Physik, West Germany), H. Spiegelhauer (Max Planck Inst. fuer Extraterrestriche Physik, West Germany), W. K. H. Schmidt (Max Planck Inst. fuer Extraterrestriche Physik, West Germany), F. Siohan, J. F. Ormes, V. K. Balasubrahmanyan, and J. F. Arens Oct. 1979 43 p refs Submitted for publication
(NASA-TM-80587) Avail: NTIS HC A03/MF A01 CSCL 03B

The chemical composition cosmic rays as a function of energy in the range of a few GeV/nucleon to some hundreds of GeV/nucleon for boron through iron are presented. The experiment combined an ionization spectrometer and a gas Cherenkov counter, which was flown on a balloon, to perform two different and independent energy measurements. The experimental apparatus is described in detail. The energy dependence of the cosmic ray escape length for boron and iron is reported and predicted changes in the energy dependence of the ratios of primary nuclei O/C and iron/C+O are discussed. A.W.H.

N80-17012*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md. High Energy Astrophysics Lab.
THE UNIQUE COSMIC EVENT OF 1979 MARCH 5
Thomas L. Cline Dec. 1979 17 p refs Submitted for publication
(NASA-TM-80630) Avail: NTIS HC A02/MF A01 CSCL 03B

A transient that appears to be neither a typical gamma ray burst nor an X-ray burster was found to possess a variety of unusual properties that would seem to be mutually inconsistent. The observed parameters include a 200 microsecond onset time, a subsequent temporal intensity oscillation with an 0 second period, a spectral feature consistent with a moderately red shifted positron annihilation line, a maximum photon flux greater than any known gamma ray or x ray transient, and a very accurate source location measurement consistent with that of the N49 supernova remnant associated with the large Magellanic Cloud at 55 kpc distance. A.W.H.

N80-17013# California Univ., Livermore. Lawrence Livermore Lab.
STUDY OF ENERGETIC ELECTRONS IN THE OUTER RADIATION-BELT REGIONS USING DATA OBTAINED BY THE LLL SPECTROMETER ON OGO-5 IN 1968
H. I. West, Jr., R. M. Buck, and G. Davidson (Lockheed Missiles and Space Co., Palo Alto, Calif.) 26 Jul. 1979 84 p refs
(Contract W-7405-eng-48)
(UCRL-52807) Avail: NTIS HC A05/MF A01

An account is given of measurements of electrons made by the LLL magnetic electron spectrometer (60 to 3000 keV in seven differential energy channels) on the Ogo-5 satellite in the

earth's outer-belt regions during 1968 and early 1969. The data were analyzed specifically to determine pitch-angle diffusion lifetimes as a function of energy in the L-range 2 to 5. As a part of this effort, the general dynamics of these regions were studied in terms of the time dependent energy spectra, and pitch-angle distrubtion for the seven energy groups were obtained as a function of L wtih representative values presented for L = 2.5 to 6. The pitch-angle-diffusion results were used to analyze the dyanmics of the electrons injected following the intense storms on October 31 and November 1, 1968, in terms of radial diffusion. The derived diffusion coefficients provide a quite reasonable picture of electron transport in the radiation belts. Both the radial-and pitch-angle-diffusion results are compared with earlier results.
DOE

99 GENERAL

N80-17014*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FISCAL YEAR 1979 SCIENTIFIC AND TECHNICAL REPORTS, ARTICLES, PAPERS AND PRESENTATIONS
O. L. White, comp. Oct. 1979 62 p
(NASA-TM-78250) Avail: NTIS HC A04/MF A01 CSCL 05B

This bibliography lists approximately 590 formal NASA technical reports, papers published in technical journals, presentations by MSFC personnel, and reports of MSFC contractors introduced into the NASA scientific and technical information system in 1979.
J.M.S.

N80-17015# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENTIFIC AFFAIRS, NO. 659
11 Jan. 1980 146 p Transl. into ENGLISH from various East European journals
(JPRS-74911) Avail: NTIS HC A07/MF A01

Developments in the various theoretical and applied scientific disciplines and technical fields are presented. The administration, structure, personnel, and research plans of leading East European scientific organizations and institutions are described. Applications of microelectronics to optical instrumentation and computers are emphasized. For individual titles, see N80-17016 through N80-17020.

N80-17016# Joint Publications Research Service, Arlington, Va.
CARL ZEISS JENA PRODUCTION OF OPTICAL PRECISION INSTRUMENTS DESCRIBED c74
K. Muetze *In its* E. Europe Rept.: Sci. Affairs, No. 659 (JPRS-74911) 11 Jan. 1980 p 23-54 Transl. into ENGLISH from Feingeraetetechnik (E. Berlin), v. 28, no. 10, 1979 p 437-445 (For primary document see N80-17015 07-99)
Avail: NTIS HC A07/MF A01

Optical precision instrument construction is presented. Developmental tendencies in instrument construction, the role of automation, and instrument performance and reliability are discussed.
R.E.S.

N80-17017# Joint Publications Research Service, Arlington, Va.
DEVICES FOR MANUFACTURE OF MICROSTRUCTURES, CHIPS DESCRIBED c33
K.-W. Gommel *In its* E. Europe Rept.: Sci. Affairs, No. 659 (JPRS-74911) 11 Jan. 1980 p 58-74 Transl. into ENGLISH from Feingeraetetech. (E. Berlin), v. 28, no. 10, 1979 p 446-450 (For primary document see N80-17015 07-99)
Avail: NTIS HC A07/MF A01

The process of microstructuring in semiconductor engineering is discussed. Problems and trends in microstructure production are described.
R.E.S.

N80-17018# Joint Publications Research Service, Arlington, Va.
MICROCOMPUTER-BASED CNC 600 NUMERICAL CONTROL SYSTEM DESCRIBED c63
Guenter Wollenberg *In its* E. Europe Rept.: Sci. Affairs, No. 659 (JPRS-74911) 11 Jan. 1980 p 77-99 refs Transl. into ENGLISH from Radio Fernsehen Elek. (E. Berlin), v. 28, no. 11 1979 p 694-700 (For primary document see N80-17015 07-99)
Avail: NTIS HC A07/MF A01

The numerical control system CNC 600, which is based on microprocessors, is presented.
R.E.S.

N80-17019# Joint Publications Research Service, Arlington, Va.
INTERFACE ASSEMBLY FOR USE IN K 1520 SYSTEM DESCRIBED c60
Siegfried Wädner and Rainer Bauch *In its* E. Europe Rept.: Sci. Affairs, No. 659 (JPRS-74911) 11 Jan. 1980 p 100-109 Transl. into ENGLISH from Radio Fernsehen Elek. (E. Berlin), v. 28, no. 9, 1979 p 558-560 (For primary document see N80-17015 07-99)
Avail: NTIS HC A07/MF A01

An interface module for operating a display screen unit was developed. This module fits smoothly into the K 1520 microcomputer system. It is particularly suited to control the ANA 440 S display screen unit of the VEB Combine Robotron, but it can also be used to control other display screen units. Through a supplementary high frequency adapter, it is also possible to connect the connection control to the antenna input of an arbitrary television receiver meeting European television standards. Two types of display can be programmed.
R.E.S.

N80-17020# Joint Publications Research Service, Arlington, Va.
MICROCOMPUTER SYSTEM K 1520 EXAMINED c60
Bernhard Bader *In its* E. Europe Rept.: Sci. Affairs, No. 659 (JPRS-74911) 11 Jan. 1980 p 110-128 Transl. into ENGLISH from Radio Fernsehen Elek. (E. Berlin), v. 28, no. 10, 1979 p 616-620 (For primary document see N80-17015 07-99)
Avail: NTIS HC A07/MF A01

The application of microcomputer technology in the national economy of East Germany is discussed. The application of the Robotron K 1520 microcomputer system is described in detail. The system design of the K 1520 system is presented and it's advantages are described.
R.E.S.

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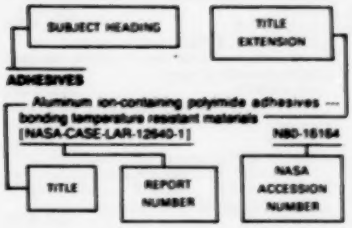
Typical Subject Index Listing



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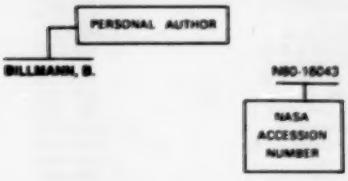

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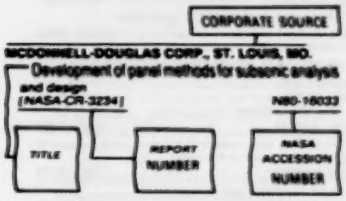

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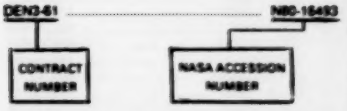

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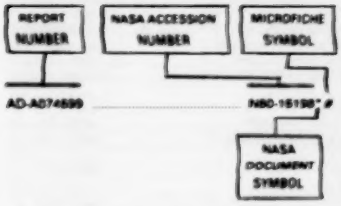

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NASA-TM-81380 — N80-16914* #
NASA-TM-81396 — N80-16165* #
NASA-TM-81398 — N80-16143* #
NASA-TM-81403 — N80-16341* #
NASA-TM-81404 — N80-16107* #
NASA-TM-81405 — N80-16102* #
NASA-TM-81408 — N80-16494* #
NASA-TM-81412 — N80-16097* #
NASA-TM-81414 — N80-16342* #
NASA-TM-81424 — N80-16886* #

NASA-TP-1424 — N80-16742* #
NASA-TP-1515 — N80-16032* #
NASA-TP-1570 — N80-16676* #
NASA-TP-1605 — N80-16118* #
NASA-TP-1609 — N80-16141* #

NBS-GCR-ETIF-7962 — N80-16598 #

NBS-SP-260-65 — N80-16135 #
NBS-SP-400-59 — N80-16287 #
NBS-SP-500-53 — N80-16751 #
NBS-SP-500-54 — N80-16787 #

NBS-TN-1015 — N80-16877 #
NBS-TN-1110 — N80-16316 #

NBSIR-79-1607 — N80-16256* #
NBSIR-79-1613 — N80-16271 #
NBSIR-79-1616 — N80-16059 #
NBSIR-79-1771 — N80-16560 #
NBSIR-79-1799 — N80-16572 #

NCAR/TN-142 — N80-16427 #

NGS-18 — N80-16664 #

NIH-N01-HV-4-2901-6 — N80-16733 #
NIH-N01-HV-8-2919-1 — N80-16732 #
NIH-N01-HV-8-2921-1 — N80-16731 #

NMEI-17 — N80-16553 #
NMEI-31 — N80-16570 #
NMEI-41 — N80-16569 #
NMEI-43 — N80-16562 #

NMFS/SEFC-6 — N80-16709 #

NOAA-EDIS-PUB-41/1 — N80-16661 #

NOAA-TM-ERL/GLERL-25 ..... N80-16440 #

NOAA-TM-ERL/PMEL-15 ..... N80-16711 #

NOAA-TM-NMFS-SEFC-6 ..... N80-16709 #

NOAA-TM-NOS-NGS-18 ..... N80-16664 #
NOAA-TM-NOS-NGS-19 ..... N80-16432 #

NOAA-TR-ERL-WPL-43 ..... N80-16669 #
NOAA-TR-ERL-WPL-44 ..... N80-16660 #

NOAA-TR-NESS-78 ..... N80-16067 #

NOAA-79080201 ..... N80-16681 #
NOAA-79080902 ..... N80-16711 #
NOAA-79080903 ..... N80-16669 #
NOAA-79081307 ..... N80-17010 #
NOAA-79081605 ..... N80-16440 #
NOAA-79082107 ..... N80-16052 #
NOAA-79083001 ..... N80-16709 #
NOAA-79083003 ..... N80-16604 #
NOAA-79090403 ..... N80-16666 #
NOAA-79090404 ..... N80-16664 #
NOAA-79090405 ..... N80-16432 #
NOAA-79090701 ..... N80-16067 #
NOAA-79091301 ..... N80-16594 #
NOAA-79091302 ..... N80-16592 #
NOAA-79091303 ..... N80-16703 #
NOAA-79092103 ..... N80-16661 #
NOAA-79092406 ..... N80-16657 #

NSF/IDOE-79/54 ..... N80-16708 #
NSF/IDOE-79/55 ..... N80-16708 #
NSF/IDOE-79/56 ..... N80-16707 #
NSF/IDOE-79/58 ..... N80-16713 #
NSF/IDOE-79/76 ..... N80-16712 #

NSF/IDOE/CUEA-TR-47 ..... N80-16706 #

NSF/IDOE/CUEA/TR-49 ..... N80-16713 #
NSF/IDOE/CUEA/TR-50 ..... N80-16707 #
NSF/IDOE/CUEA/TR-51 ..... N80-16708 #

NSF/RA-780418 ..... N80-16953 #
NSF/RA-780424 ..... N80-16952 #
NSF/RA-780430 ..... N80-16967 #
NSF/RA-780434 ..... N80-16968 #
NSF/RA-780618 ..... N80-16888 #
NSF/RA-780680 ..... N80-16040 #
NSF/RA-780681 ..... N80-16253 #
NSF/RA-790079 ..... N80-16969 #
NSF/RA-790107 ..... N80-16587 #
NSF/RA-790116 ..... N80-16554 #
NSF/RA-790117 ..... N80-16596 #
NSF/RA-790127 ..... N80-16662 #
NSF/RA-790130 ..... N80-16656 #
NSF/RA-790131 ..... N80-16655 #
NSF/RA-790132 ..... N80-16252 #
NSF/RA-790134 ..... N80-16352 #
NSF/RA-790135 ..... N80-16351 #
NSF/RA-790143 ..... N80-16442 #
NSF/RA-790144 ..... N80-16597 #
NSF/RA-790161 ..... N80-16239 #
NSF/RA-790165 ..... N80-16250 #
NSF/RA-790179 ..... N80-16251 #
NSF/RA-790180 ..... N80-16659 #
NSF/RA-790186 ..... N80-16254 #
NSF/RA-790205 ..... N80-16249 #
NSF/RA-790206 ..... N80-16812 #
NSF/RA-790240 ..... N80-16658 #

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NTIA/REPT-79/23 ..... N80-16268 #
NTIA/REPT-79/24 ..... N80-16269 #

NTIA/TM-79/15 ..... N80-16267 #

NTIS/PS-75/036 ..... N80-16053 #
NTIS/PS-75/065 ..... N80-16826 #
NTIS/PS-75/474 ..... N80-16333 #
NTIS/PS-75/480 ..... N80-16976 #
NTIS/PS-75/663 ..... N80-16319 #
NTIS/PS-75/664 ..... N80-16318 #
NTIS/PS-75/671 ..... N80-16053 #
NTIS/PS-75/694 ..... N80-16826 #
NTIS/PS-75/764 ..... N80-16353 #
NTIS/PS-76/0560 ..... N80-16976 #
NTIS/PS-76/0561 ..... N80-16977 #
NTIS/PS-76/0569 ..... N80-16333 #
NTIS/PS-76/0662 ..... N80-16063 #
NTIS/PS-76/0710 ..... N80-16983 #
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NTIS/PS-76/0732 ..... N80-16319 #
NTIS/PS-76/0788 ..... N80-16826 #
NTIS/PS-77/0635 ..... N80-16976 #
NTIS/PS-77/0637 ..... N80-16977 #
NTIS/PS-77/0710 ..... N80-16333 #
NTIS/PS-77/0765 ..... N80-16063 #
NTIS/PS-77/0766 ..... N80-16353 #
NTIS/PS-77/0767 ..... N80-16354 #
NTIS/PS-77/0782 ..... N80-16319 #
NTIS/PS-77/0783 ..... N80-16318 #
NTIS/PS-77/0839 ..... N80-16583 #
NTIS/PS-77/0891 ..... N80-16826 #
NTIS/PS-78/0836 ..... N80-16557 #
NTIS/PS-78/0839 ..... N80-16558 #
NTIS/PS-78/0840 ..... N80-16566 #
NTIS/PS-78/0841 ..... N80-16567 #
NTIS/PS-78/0842 ..... N80-16571 #
NTIS/PS-78/0879 ..... N80-16319 #
NTIS/PS-78/0880 ..... N80-16976 #
NTIS/PS-78/0881 ..... N80-16977 #
NTIS/PS-78/0882 ..... N80-16319 #
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NTIS/PS-78/0896 ..... N80-16333 #
NTIS/PS-78/0903 ..... N80-16353 #
NTIS/PS-78/0905 ..... N80-16354 #
NTIS/PS-78/0962 ..... N80-16563 #
NTIS/PS-78/1032 ..... N80-16826 #
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NTIS/PS-79/0926/0 ..... N80-16557 #
NTIS/PS-79/0927/8 ..... N80-16558 #
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NTIS/PS-79/0930/2 ..... N80-16571 #
NTIS/PS-79/0957/5 ..... N80-16319 #
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NTIS/PS-79/0991/4 ..... N80-16977 #
NTIS/PS-79/0995/5 ..... N80-16353 #
NTIS/PS-79/0996/3 ..... N80-16354 #
NTIS/PS-79/1017/7 ..... N80-16057 #
NTIS/PS-79/1053/2 ..... N80-16074 #
NTIS/PS-79/1067/2 ..... N80-16334 #
NTIS/PS-79/1068/0 ..... N80-16333 #
NTIS/PS-79/1069/8 ..... N80-16563 #
NTIS/PS-79/1077/1 ..... N80-16827 #
NTIS/PS-79/1078/9 ..... N80-16826 #

NTIS/SA-79/07 ..... N80-16990 #
NTIS/SA-79/08 ..... N80-16958 #

NUREG-CR-0818 ..... N80-16235 #

NUS-3158-VOL-2 ..... N80-16873 #
NUS-3183-VOL-3 ..... N80-16874 #
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NUSC-TR-6011 ..... N80-16801 #

NVO-1559-1 ..... N80-16997 #

NYSSGP-AM-79-002 ..... N80-16584 #

OAOPS-1.2-114 ..... N80-16618 #

ONR-CR-188-007-1 ..... N80-16280 #
ONR-CR-212-223-5-F ..... N80-16037 #

ORD/TAD-79/10 ..... N80-16871 #

ORNL-5487 ..... N80-16506 #

ORNL/CON-18 ..... N80-16551 #

ORNL/CSD-43 ..... N80-16362 #

ORNL/CSD/TM-67 ..... N80-16777 #
ORNL/CSD/TM-82 ..... N80-16781 #

ORNL/NUREG/TM-324 ..... N80-16235 #

ORNL/SUB-78/13538/1 ..... N80-16546 #

ORNL/TM-6496 ..... N80-16992 #
ORNL/TM-6500 ..... N80-16996 #
ORNL/TM-6527 ..... N80-16959 #
ORNL/TM-6541 ..... N80-16967 #
ORNL/TM-6567 ..... N80-16993 #
ORNL/TM-6575 ..... N80-16930 #

ORO-3018-T1 ..... N80-16721 #
ORO-3992-342 ..... N80-16930 #
ORO-3992-343 ..... N80-16931 #
ORO-3992-344 ..... N80-16870 #
ORO-3992-345 ..... N80-16266 #
ORO-4721-T1 ..... N80-16124 #
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OTA/TM/E-1 ..... N80-16194 #

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OWRT-A-077-NC(11) ..... N80-16710 #

OWRT-B-086-IND(1) ..... N80-16435 #
OWRT-B-139-UTAH(5) ..... N80-16434 #
OWRT-B-139-UTAH(8) ..... N80-16436 #

OWRT-C-7517(6226)(1) ..... N80-16439 #

OWRT-3343(1) ..... N80-16134 #

P-1340 ..... N80-16646 #

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PB-296039/1 ..... N80-16968 #
PB-298439/1 ..... N80-16419 #
PB-298440/9 ..... N80-16420 #
PB-298441/7 ..... N80-16421 #
PB-298442/5 ..... N80-16422 #
PB-298443/3 ..... N80-16423 #
PB-298458/9 ..... N80-16615 #
PB-298529/9 ..... N80-16696 #
PB-298555/4 ..... N80-16259* #
PB-298668/3 ..... N80-16569 #
PB-298820/2 ..... N80-16437 #
PB-298962/2 ..... N80-16439 #
PB-298963/0 ..... N80-16697 #
PB-299013/3 ..... N80-16436 #
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PB-299128/3 ..... N80-16241 #
PB-299127/1 ..... N80-16242 #
PB-299205/5 ..... N80-16617 #
PB-299307/1 ..... N80-16564 #
PB-299308/9 ..... N80-16565 #
PB-299294/9 ..... N80-16570 #
PB-299383/0 ..... N80-16192 #
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PB-299867/2 ..... N80-16311 #
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PB-300296/1 ..... N80-16267 #
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PB-300314/2 ..... N80-16560 #
PB-300336/5 ..... N80-16616 #
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PB-300373/8 N80-16954 #
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PB-300399/3 N80-16238 #
PB-300406/6 N80-16089 #
PB-300409/0 N80-16434* #
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PB-300461/1 N80-16135 #
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RADC-TR-79-205-ADD-1 N80-16775 #
RADC-TR-79-205-ADD-2 N80-16776 #
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REC-ERC-79-6 N80-16286 #
REF-79-1 N80-16703 #
REF-79-2 N80-16713 #
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REPT-1 N80-16249 #
REPT-64-120-631060 N80-16965 #
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REPT-79-070 N80-16356* #
REPT-79/SM/3 N80-16862 #
REPT-80-FM-6 N80-16073* #
REPT-172 N80-16302 #
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RHO-SA-113 N80-16099 #
RM-369-REV N80-16805 #
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SAND-78-0962-VOL-3 N80-16541 #
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SAND-78-8801 N80-16347 #
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